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researches in physiology and medicine tend
to show that even the moderate drinking
of alcohol is impeding. — Charles W. Eliot

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ALCOHOL

How It Affects the Individual
the Community and the Race

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BY

HENRY SMITH WILLIAMS, M.D., LL.D.

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How it Affects the Individual,
the Community, and the Race

BY

HENRY SMITH WILLIAMS, M.D., LL.D.



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PREFACE

THE two introductory chapters of the following text reproduce, with minor additions, the text of two articles contributed to *McClure's Magazine* for October and December, 1908, the original titles being here retained as chapter headings. I had contemplated expanding these articles very considerably for final publication in book form; but the extreme popularity of the condensed presentation among all classes of readers has made me question the advisability of so doing.

I might cite many proofs of this popularity, but I content myself with the single statement that the editors of *McClure's Magazine* have received upward of one thousand requests for permission to reprint these articles, wholly or in part, either in current periodicals or in pamphlet form for gratuitous distribution.

The request has come from temperance organizations and various other societies, from editors of papers, and—prominently—from the heads of large manufacturing and commercial enterprises,

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who wish to circulate the reprints among their employees.

This seems to furnish unequivocal evidence that the articles in their original form—giving a concise and an entirely impersonal and unimpassioned presentation of the findings of recent science as to the effects of alcohol—did really “meet a long-felt want,”—if the use of that much-abused phrase may be pardoned.

Wherefore, as I said, it seems best, in presenting the facts in question in a somewhat more lasting form, to adhere closely to the original text.

It seems desirable, on the other hand, to make accessible, to such readers as may wish it, a somewhat more detailed presentation of certain aspects of the subject. Hence the Appendix, which will be found to contain a certain amount of altogether new matter, together with various statistical and other tables calculated to substantiate some statements that, for the sake of brevity, were presented rather summarily in the text.

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CHAPTER I

ALCOHOL AND THE INDIVIDUAL

SOME very puzzling differences of opinion about the use of alcoholic beverages find expression. This is natural enough, since alcohol is a very curious drug, and the human organism a very complex mechanism. The effects of this drug upon this mechanism are often very mystifying. Not many persons are competent to analyze these effects in their totality. Still fewer can examine any of them quite without prejudice. But in recent years a large number of scientific investigators have attempted to substitute knowledge for guesswork as to the effects of alcohol, through the institution of definitive experiments. Some have tested its effects on the digestive apparatus; others, its power over the heart and voluntary muscles; still others, its influence upon the brain. On the whole, the results of these experiments are

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singularly consistent. Undoubtedly they tend to upset a good many time-honored preconceptions. But they give better grounds for judgment as to what is the rational attitude toward alcohol than have hitherto been available.¹

The traditional rôle of alcohol is that of a stimulant. It has been supposed to stimulate digestion and assimilation; to stimulate the heart's action; to stimulate muscular activity and strength; to stimulate the mind. The new evidence seems to show that, in the final analysis, alcohol stimulates none of these activities; that its final effect is everywhere depressive and inhibitory (at any rate, as regards higher functions) rather than stimulative; that, in short, it is properly to be classed with the anesthetics and narcotics. The grounds for this view should be of interest to every user of alcohol; of interest, for that matter, to every citizen, considering that more than two thousand million gallons of alcoholic beverages are consumed in the United States each year.²

I should like to present the new evidence as concisely as possible. I shall attempt, however, to describe some of the more significant observations and experiments in sufficient detail to enable the reader to draw his own conclusions. To make room for this, I must deal with other portions of the testimony in a very summary manner. As regards digestion, for example, I must be content to note that the experiments show that alcohol

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does indeed stimulate the flow of digestive fluids, but that it also tends to interfere with their normal action ; so that ordinarily one effect neutralizes the other.³ As regards the action on the heart, I shall merely state that the ultimate effect of alcohol is to depress, in large doses to paralyze, that organ.⁴ These, after all, are matters that concern the physician rather than the general reader.

The effect of alcohol on muscular activity has a larger measure of popular interest ; indeed, it is a question of the utmost practicality. The experiments show that alcohol does not increase the capacity to do muscular work, but distinctly decreases it. Doubtless this seems at variance with many a man's observation of himself ; but the explanation is found in the fact that alcohol blurs the judgment. As Voit remarks, it gives, not strength, but, at most, the feeling of strength. A man may think he is working faster and better under the influence of alcohol than he would otherwise do ; but rigidly conducted experiments do not confirm this opinion. "Both science and the experience of life," says Dr. John J. Abel, of Johns Hopkins University, "have exploded the pernicious theory that alcohol gives any persistent increase of muscular power. The disappearance of this universal error will greatly reduce the consumption of alcohol among laboring men. It is well understood by all who control large bodies

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of men engaged in physical labor that alcohol and effective work are incompatible."

It is even questionable whether the energy derived from the oxidation of alcohol in the body can be directly used at all as a source of muscular energy. Such competent observers as Schumberg and Scheffer independently reached the conclusion that it cannot. They hold, in other words, that alcohol is not to be ranked as a true foodstuff like the sugars and starches, which when oxidized in the body supply energy for muscular work; but rather that it must rank with such excitants as tea and coffee, which stimulate the muscles only when a sufficient supply of nutrient material is circulating in the blood. Dr. Abel inclines to the same opinion. "Both science and empiricism," he says, "teach that alcohol is not a practicable source of energy in the performance of physical labor." Professor Atwater, on the other hand, inclined to the view that, when alcohol is burned in the body, the heat generated may be directly utilized in the promotion of muscular activity; but he was careful to state that his experiments did not prove, but only suggested, this conclusion.

From a practical standpoint, it really makes no difference at all as to which one of these views is correct; since, as just stated, all observers are agreed that alcohol, whether or not it supplies some energy to muscles, cannot supply enough to keep them at their normal level of activity, let

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alone all question of exceeding it. As to this, the testimony from widely different sources is unanimous. Small doses of alcohol may, indeed, stimulate muscular activity for a very brief period (half an hour or less), but beyond that the paralyzing action of the drug becomes effective, and the total amount of work performed is uniformly found to be less with the alcohol than without it.

Many series of experiments through which these results have been established have been performed in laboratories, with the aid of apparatus specially devised for testing the action of muscles. Those of Dr. Schnyder and Professor Dubois, made at Berne, are particularly instructive. They used an apparatus, called an "ergograph," designed to test the strength and endurance of the muscles of the index-finger. Among other results, their experiments showed a loss of muscular power equivalent to 8 per cent. when wine containing about one ounce (29.4 grams) of alcohol was taken in the course of a luncheon, as compared with the normal muscular capacity when the same quality of food was taken without alcohol.

In commenting upon these experiments of Dr. Schnyder and Professor Dubois, Professor M. A. Rosanoff, of Clark University, and Dr. A. J. Rosanoff, of the Kings Park (New York) State Hospital, draw the following conclusions:

"(1) Unlike an ordinary food, alcohol, when taken in moderate quantity on an empty stomach,

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has two distinct effects on the muscular system—a strengthening one and a weakening one. During the first brief stage after it is taken, the strengthening effect predominates, the alcohol probably being utilized as a food by the exhausted body. But no sooner is the first stage over than the weakening effect becomes more prominent, the alcohol probably acting injuriously upon the nervous system.

“(2) Moderate amounts of alcohol taken with a meal effect a very considerable lowering of the capacity for doing muscular work. The widespread notion that moderate drinking with meals helps a laborer do his work, is false.”⁵

The experiments of A. F. Hellsten, performed at Helsingfors in 1903-04, are cited by Professor and Dr. Rosanoff as entirely corroborative of the effects of alcohol when taken on an empty stomach. Hellsten's experiments showed that “almost immediately after being introduced into the system, alcohol raises the working capacity of the muscles. From twelve to forty minutes later, however, a lowering sets in, and the state of lowered muscular efficiency lasts at least two hours. Thus alcohol acts at first as a stimulating, afterward as a paralyzing agent.” Schnyder and Dubois, in the experiments in which alcohol was given without food, administered only a single glass of wine, containing but 14.7 grams or less than half an ounce, of alcohol.

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Numerous other experimenters have made corroborative observations of the depressive effect of alcohol upon the muscular system, the experiments differing widely in character. For example, Professor Atwater, in a famous series of experiments, found that the men in his respiratory cabinet seemed to perform somewhat less work under the influence of alcohol, even in the small doses administered, than without it. More specific data are furnished by Professor Hodge's experiments on dogs, to which I shall have occasion to refer in another connection. He tested very carefully the activity and the resistance to fatigue of dogs that were given alcohol regularly, as compared with kennel companions that received no alcohol. The results showed that the spontaneous activities of the alcoholics were only about two thirds those of their normal companions. When tests were made that introduced elements of effort and fatigue, as in the pursuit and retrieving of a ball thrown again and again, the alcoholics developed but little more than half the efficiency of their companions, and showed evidence of very much greater fatigue.

It will be understood, of course, that the dogs in question were not acutely intoxicated. They were merely suffering from the depressing effects of considerable quantities of alcohol taken day by day.⁶ They might be termed habitual heavy drinkers, except that they did not take the alcohol voluntarily. It is interesting to note, in conclusion,

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that one of the tipplers gradually recovered his normal activity when alcohol was no longer administered to him, but that a year's time elapsed before he approximately rivaled his normal companion.

Such experiments as these tend to reveal alcohol in its true light. They not only show the negative value of alcohol as a muscle stimulant, but they go far toward the substantiation of Dr. Abel's opinion that "alcohol is not a food in the sense in which fats and carbo-hydrates are food"; that it should rather be defined "as an easily oxidizable drug with numerous untoward effects which inevitably appear when a certain minimum dose is exceeded"; and that it should be classed "with the more or less dangerous stimulants and narcotics, such as hasheesh, tobacco, etc., rather than with truly sustaining foodstuffs." But still more convincing evidence as to this will appear as we now turn to examine the alleged stimulating effects of alcohol upon the brain and nervous system.

Alcohol as a Brain Stimulant

WE are here confronted with a mass of evidence proving that alcohol has, if possible, even less right to be considered a mental stimulant than a stimulant to digestion and to muscular activity. The celebrated physicist Von Helmholtz, one of

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the foremost thinkers of the nineteenth century, declared that the very smallest quantity of alcohol served effectively, while its influence lasted, to banish from his mind all possibility of creative effort or of the solution of any abstruse problem. The results of recent experiments in the field of physiological psychology serve to convince one that the same thing is true of every other mind capable of creative thinking. Certainly all the evidence goes to show that no mind is capable of its best efforts when influenced by even small quantities of alcohol. If any reader of these words is disposed to challenge this statement, on the strength of his own personal experience, I would ask him to reflect carefully as to whether what he has regarded as a stimulant effect may not be better explained along lines suggested by these words of Professor James: "The reason for craving alcohol is that it is an anesthetic even in moderate quantities. It obliterates a part of the field of consciousness and abolishes collateral trains of thought."

The experimental evidence that tends to establish the position of alcohol as an inhibitor and disturber rather than a promoter of mental activity has been gathered largely by German investigators. I may add that the results of their work in this field are being published in pamphlets and booklets that find wide circulation and that are creating a public interest in the temperance move-

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ment that would surprise any one who thinks of the Fatherland as the place of universal beer-drinking. The average German of to-day is keenly alive to the position of Germany as a world-power. Convince him that the habitual use of alcoholic beverages tends to lower the efficiency of a race, and he will become an ardent advocate of water-drinking, to the astonishment of the world. And precisely this conviction is gaining ground day by day, thanks to the promulgation of literature presenting the results of these new psychological experiments to which we are referring.

Many of these experiments are of a rather technical character, aiming to test the basal operations of the mind. Others, however, are eminently practical, as we shall see. The earliest experiments, made by Exner in Vienna as long ago as 1873, aimed to determine the effect of alcohol upon the so-called reaction-time. The subject of the experiment sits at a table, with his finger upon a telegraph key. At a given signal—say a flash of light—he releases the key. The time that elapses between signal and response—measured electrically in fractions of a second—is called the simple or direct reaction-time. This varies for different individuals, but is relatively constant, under given conditions, for the same individual. Exner found, however, that when an individual had imbibed a small quantity of al-

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cohol his reaction-time was lengthened, though the subject believed himself to be responding more promptly than before.

These highly suggestive experiments attracted no very great amount of attention at the time. Some years later, however, they were repeated by several investigators, including Dietl, Vintschgau, and in particular Kraepelin and his pupils. It was then discovered that, in the case of a robust young man, if the quantity of alcohol ingested was very small, and the tests were made immediately, the direct reaction-time was not lengthened, but appreciably shortened instead. If, however, the quantity of alcohol was increased, or if the experiments were made at a considerable interval of time after its ingestion, the reaction-time fell below the normal, as in Exner's experiments.

Psychologists have not agreed among themselves as to whether this early shortening of the reaction-time implies an actual temporary stimulation of the brain, or whether it may not better be explained as a weakening of normal inhibition. For our present purpose, it does not matter in the least which technical explanation is accepted. It suffices that the ultimate effect of the alcohol, whether taken in small doses or large, is a slowing of the very elementary and relatively simple mental process involved in this reaction.

Subsequent experiments tested mental processes of a somewhat more complicated character. For

example, the subject would place each hand on a telegraph key, at right and left. The signals would then be varied, it being understood that one key or the other would be pressed promptly accordingly as a red or a white light appeared. It became necessary, therefore, to recognize the color of the light, and to recall which hand was to be moved at that particular signal: in other words, to make a choice not unlike that which a locomotive engineer is required to make when he encounters an unexpected signal-light. The tests showed that after the ingestion of a small quantity of alcohol—say a glass of beer—there was a marked disturbance of the mental processes involved in this reaction. On the average, the keys were released more rapidly than before the alcohol was taken, but the wrong key was much more frequently released than under normal circumstances. Speed was attained at the cost of correct judgment. Thus, as Dr. Stier remarks, the experiment shows the elements of two of the most significant and persistent effects of alcohol, namely, the vitiating of mental processes and the increased tendency to hasty or incoördinate movements. Stated otherwise, a leveling-down process is involved, whereby the higher function is dulled, the lower function accentuated.

Equally suggestive are the results of some experiments devised by Ach and Maljarewski to test the effects of alcohol upon the perception and com-

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prehension of printed symbols. The subject was required to read aloud a continuous series of letters or meaningless syllables or short words, as viewed through a small slit in a revolving cylinder. It was found that after taking a small quantity of alcohol the subject was noticeably less able to read correctly. His capacity to repeat, after a short interval, a number of letters correctly read, was also much impaired. He made more omissions than before, and tended to substitute words and syllables for those actually seen. It is especially noteworthy that the largest number of mistakes were made in the reading of meaningless syllables—that is to say, in the part of the task calling for the highest or most complicated type of mental activity.

Another striking illustration of the tendency of alcohol to impair the higher mental processes was given by some experiments instituted by Kraepelin to test the association of ideas. In these experiments a word is pronounced, and the subject is required to pronounce the first word that suggests itself in response. Some very interesting secrets of the subconscious personality are revealed thereby, as was shown, for example, in a series of experiments conducted in 1907 at Zurich by Dr. Frederick Peterson, of New York. But I cannot dwell on these here. Suffice it for our purpose that the possible responses are of two general types. The suggested word being, let us

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say, "book," the subject may (1) think of some word associated logically with the idea of a book, such as "read" or "leaves"; or he may (2) think of some word associated merely through similarity of sound, such as "cook" or "shook." In a large series of tests, any given individual tends to show a tolerably uniform proportion between the two types of association; and this ratio is in a sense explicative of his type of mind. Generally speaking, the higher the intelligence, the higher will be the ratio of logical to merely rhymed associations. Moreover, the same individual will exhibit more associations of the logical type when his mind is fresh than when it is exhausted, as after a hard day's work.

In Kraepelin's experiments it appeared that even the smallest quantity of alcohol had virtually the effect of fatiguing the mind of the subject, so that the number of his rhymed responses rose far above the normal. That is to say, the lower form of association of ideas was accentuated at the expense of the higher. In effect, the particular mind experimented upon was always brought for the time being to a lower level by the alcohol.

The Effect of a Bottle of Wine a Day

WHEN a single dose of alcohol is administered, its effects gradually disappear, as a matter of course.

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But they are far more persistent than might be supposed. Some experiments conducted by Fürer are illuminative as to this. He tested a person for several days, at a given hour, as to reaction-time, the association of ideas, the capacity to memorize, and facility in adding. The subject was then allowed to drink two liters of beer in the course of a day. No intoxicating effects whatever were to be discovered by ordinary methods. The psychological tests, however, showed marked disturbance of all the reactions, a diminished capacity to memorize, decreased facility in adding, etc., not merely on the day when the alcohol was taken, but on succeeding days as well. Not until the third day was there a gradual restoration to complete normality; although the subject himself—and this should be particularly noted—felt absolutely fresh and free from after-effects of alcohol on the day following that on which the beer was taken.

Similarly Rüdin found the effects of a single dose of alcohol to persist, as regards some forms of mental disturbance, for twelve hours, for other forms twenty-four hours, and for yet others thirty-six hours or more. But Rüdin's experiments bring out another aspect of the subject, which no one who considers the alcohol question in any of its phases should overlook—the fact, namely, that individuals differ greatly in their response to a given quantity of the drug. Thus, of four healthy

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young students who formed the subjects of Rüdín's experiment, two showed very marked disturbance of the mental functions for more than forty-eight hours, whereas the third was influenced for a shorter time, and the fourth was scarcely affected at all. The student who was least affected was not, as might be supposed, one who had been accustomed to take alcoholics habitually, but, on the contrary, one who for six years had been a total abstainer.

No one will infer from this, of course, that abstinence from alcohol gives immunity to its effects when taken: the experiment merely illustrates the individual differences of temperament that must always be considered in dealing with so complex an organism as the human body. No one need doubt, moreover, that the student who was unaffected by the 80 grams of alcohol would have succumbed to the effects of twice or thrice the quantity.

Thus far we have witnessed the effects of a single dose of alcohol in producing immediate and relatively persistent disturbance of the mental faculties. Noting that such effects may persist for two or three days, one is led to inquire what the result will be if the dose is repeated day after day. Will there then be a cumulative effect, or will the system become tolerant of the drug and hence unresponsive? Some experiments of Smith, and others of Kürz and Kraepelin, have been directed toward the solution of this all-important

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question. The results of the experiments show a piling up of the disturbing effects of the alcohol. Kürz and Kraepelin estimate that after giving 80 grams per day to an individual for twelve successive days, the working capacity of that individual's mind was lessened by from 25 to 40 per cent. Smith found an impairment of the power to add, after twelve days, amounting to 40 per cent.; the power to memorize was reduced by about 70 per cent.⁸

Forty to 80 grams of alcohol, the amounts used in producing these astounding results, is no more than the quantity contained in one or two liters of beer or in a half-bottle to a bottle of ordinary wine. Professor Aschaffenburg, commenting on these experiments, points the obvious moral that the so-called moderate drinker, who consumes his bottle of wine as a matter of course each day with his dinner—and who doubtless would declare that he is never under the influence of liquor—is in reality never actually sober from one week's end to another. Neither in bodily nor in mental activity is he ever up to what should be his normal level.

A Loss of 10 Per Cent. in Working Efficiency

THAT this fair inference from laboratory experiments may be demonstrated in a thoroughly practical field had been shown by Professor Aschaffenburg

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burg himself, through a series of tests made on four professional typesetters. The tests were made with all the rigor of the psychological laboratory (the experimenter is a former pupil of Kraepelin), but they were conducted in a printing-office, where the subjects worked at their ordinary stands, and in precisely the ordinary way, except that the copy from which the type was set was always reprint, to secure perfect uniformity. The author summarizes the results of the experiment as follows:

“The experiment extended over four days. The first and third days were observed as normal days, no alcohol being given. On the second and fourth days each worker received 35 grams (a little more than one ounce) of alcohol, in the form of Greek wine. A comparison of the results of work on normal and on alcoholic days showed, in the case of one of the workers, no difference. But the remaining three showed greater or less retardation of work, amounting in the most pronounced case to almost 14 per cent. As type-setting is paid for by measure, such a worker would actually earn 10 per cent. less on days when he consumed even this small quantity of alcohol.”

In the light of such observations, a glass of beer or even the cheapest bottle of wine is seen to be an expensive luxury. To forfeit 10 per cent. of one's working efficiency is no trifling

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matter in these days, of strenuous competition. Perhaps it should be noted that the subjects of the experiment were all men habituated to the use of liquor, one of them being accustomed to take four glasses of beer each week-day and eight or ten on Sundays. This heaviest drinker was the one whose work was most influenced in the experiment just related. The one whose work was the least influenced was the only one of the four who did not habitually drink beer every day; and he drank regularly on Sundays. It goes without saying that all abstained from beer during the experiment. We may note, further, that all the men admitted that they habitually found it more difficult to work on Mondays, after the over-indulgence of Sunday, than on other days, and that they made more mistakes on that day. Aside from that, however, the men were by no means disposed to admit, before the experiment, that their habitual use of beer interfered with their work. That it really did so could not well be doubted after the experiment.⁹

The Effect of Beer-drinking on German School Children

SOME doubly significant observations as to the practical effects of beer and wine in dulling the faculties were made by Bayer, who investigated the habits of 591 children in a public school in

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Vienna. These pupils were ranked by their teachers into three groups, denoting progress as "good," "fair," or "poor," respectively. Bayer found, on investigation, that 134 of these pupils took no alcoholic drink; that 164 drank alcoholics very seldom; but that 219 drank beer or wine once daily, 71 drank it twice daily, and 3 drank it with every meal. Of the total abstainers 42 per cent. ranked in the school as "good," 49 per cent. as "fair," and 9 per cent. as "poor." Of the occasional drinkers 34 per cent. ranked as "good," 57 per cent. as "fair," and 9 per cent. as "poor." Of the daily drinkers 28 per cent. ranked as "good," 58 per cent. as "fair," and 14 per cent. as "poor." Those who drank twice daily ranked 25 per cent. "good," 58 per cent. "fair," and 18 per cent. "poor." Of the three who drank thrice daily, one ranked as "fair," and the other two as "poor." Statistics of this sort are rather tiresome; but these will repay a moment's examination. As Aschaffenburg, from whom I quote them, remarks, detailed comment is superfluous: the figures speak for themselves.

Neither in England nor America, fortunately, would it be possible to gather statistics comparable to these as to the effects of alcohol on growing children; for the Anglo-Saxon does not believe in alcohol for the child, whatever his view as to its utility for adults. The effects of alcohol upon the growing organism have, however, been

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studied here with the aid of subjects drawn from lower orders of the animal kingdom. Professor C. F. Hodge, of Clark University, gave alcohol to two kittens, with very striking results. "In beginning the experiment," he says, "it was remarkable how quickly and completely all the higher psychic characteristics of both the kittens dropped out. Playfulness, purring, cleanliness and care of coat, interest in mice, fear of dogs, while normally developed before the experiment began, all disappeared so suddenly that it could hardly be explained otherwise than as a direct influence of the alcohol upon the higher centers of the brain. The kittens simply ate and slept, and could scarcely have been less active had the greater part of their cerebral hemisphere been removed by the knife."

The Development of Fear in Alcoholized Dogs

PROFESSOR HODGE's experiments upon dogs have already been referred to. We saw that the alcoholized dogs in his kennel were lacking in spontaneous activity and in alertness in retrieving a ball. These defects must be in part explained by lack of cerebral energy, in part by weakening of the muscular system. Various other symptoms were presented that showed the lowered tone of the entire organism under the influence of alcohol; but perhaps the most interesting phenomenon was

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the development of extreme timidity on the part of all the alcoholized dogs. The least thing out of the ordinary caused them to exhibit fear, while their kennel companions exhibited only curiosity or interest. "Whistles and bells, in the distance, never ceased to throw them into a panic in which they howled and yelped, while the normal dogs simply barked." One of the dogs even had "paroxysms of causeless fear with some evidence of hallucination. He would apparently start at some imaginary object, and go into fits of howling."

The characteristic timidity of the alcoholized dogs did not altogether disappear even when they no longer received alcohol in their diet. Timidity had become with them a "habit of life." As Professor Hodge suggests, we are here apparently dealing with "one of the profound physiological causes of fear, having wide application to its phenomena in man. Fear is commonly recognized as a characteristic feature in alcoholic insanity, and delirium tremens is the most terrible form of fear psychosis known." The development of the same psychosis, in a modified degree, through the continued use of small quantities of alcohol, emphasizes the causal relation between the use of alcohol and the genesis of timidity. It shows how pathetically mistaken is the popular notion that alcohol inspires courage; and, to any one who clearly appreciates the share courage plays in the

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battle of life, it suggests yet another lamentable way in which alcohol handicaps its devotees.

Is Alcohol a Poison?

It is perhaps hardly necessary to cite further experiments directly showing the depressing effects of alcohol, even in small quantities, upon the mental activities. Whoever examines the evidence in its entirety will scarcely avoid the conclusion reached by Smith, as the result of his experiments already referred to, which Dr. Abel summarizes thus: "One-half to one bottle of wine, or two to four glasses of beer a day, not only counteract the beneficial effects of 'practice' in any given occupation, but also depress every form of intellectual activity; therefore every man who, according to his own notions, is only a moderate drinker places himself by his indulgence on a lower intellectual level and opposes the full and complete utilization of his intellectual powers."

I content myself with repeating that, to the thoughtful man, the beer and the wine must seem dear at such a price.

To any one who may reply that he is willing to pay this price for the sake of the pleasurable emotions and passions that are sometimes permitted to hold sway in the absence of those higher

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faculties of reason which alcohol tends to banish, I would suggest that there is still another aspect of the account which we have not as yet examined. We have seen that alcohol may be a potent disturber of the functions of digestion, of muscular activity, and of mental energizing. But we have spoken all along of function and not of structure. We have not even raised a question as to what might be the tangible effects of this disturber of functions upon the physical organism through which these functions are manifested. We must complete our inquiry by asking whether alcohol, in disturbing digestion, may not leave its mark upon the digestive apparatus; whether in disturbing the circulation it may not put its stamp upon heart and blood-vessels; whether in disturbing the mind it may not leave some indelible record on the tissues of the brain.

Stated otherwise, the question is this: Is alcohol a poison to the animal organism?—a poison being, in the ordinary acceptance of the word, an agent that may injuriously affect the tissues of the body and tend to shorten life.

Students of pathology answer this question with no uncertain voice. The matter is presented in a nutshell by the professor of pathology at Johns Hopkins University, Dr. William H. Welch, when he says: "Alcohol in sufficient quantities is a poison to all living organisms, both animal and vegetable." To that unequivocal pronouncement

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there is, I believe, no dissenting voice, except that a word-quibble was at one time raised over the claim that alcohol in exceedingly small doses might be harmless. The obvious answer is that the same thing is true of any and every poison whatsoever. Arsenic and strychnine, in appropriate doses, are recognized by all physicians as admirable tonics; but no one argues in consequence that they are not virulent poisons.

The evidence for the poisonous activities of alcohol is so varied and comprehensive that to present it adequately would require a volume, instead of the pages I can here devote to it. Testimony comes on one hand from the laboratory of the experimental biologist, on the other from the office of the practising physician. The statistics of hospitals, almshouses, and prisons reveal one side of the story; the scalpel and microscope of the pathologist reveal another.

Open any work on the practice of medicine quite at random, and whether you chance to read of diseased stomach or heart or blood-vessels of liver or kidneys or muscles or connective tissues or nerves or brain—it is all one: in any case you will learn that alcohol may be an active factor in the causation, and a retarding factor in the cure, of some, at least, of the important diseases of the organ or set of organs about which you are reading. You will rise with the conviction that alcohol is not merely a poison, but the most subtle, the most

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far-reaching, and, judged by its ultimate effects, incomparably the most virulent of all poisons.

Alcohol and Disease

HERE are a few corroborative facts, stated baldly, almost at random: Rauber found that a 10 per cent. solution of alcohol "acted as a definite protoplasmic poison to all forms of cell life with which he experimented—including the hydra, tape-worms, earthworms, leeches, crayfish, various species of fish, Mexican axolotl, and mammals, including the human subject." Berkley found, in four rabbits out of five in which he had induced chronic alcoholic poisoning, fatty degeneration of the heart muscle. This condition, he says, "seems to be present in all animals subject to a continued administration of alcohol in which sufficient time between the doses is not allowed for complete elimination." Cowan finds that alcoholic cases "bear acute diseases badly, failure of the heart always ensuing at an earlier period than one would anticipate." Bollinger found the beer-drinkers of Munich so subject to hypertrophied or dilated hearts as to justify Liebe in declaring that "one man in sixteen in Munich drinks himself to death."

Dr. Sims Woodhead, professor of pathology in the University of Cambridge, says of the effect of

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alcohol on the heart: "In addition to the fatty degeneration of the heart that is so frequently met with in chronic alcoholics, there appears in some cases to be an increase of fibrous tissue between the muscle fibers, accompanied by wasting of these tissues. . . . Heart failure, one of the most frequent causes of death in people of adult and advanced years, is often due to fatty degeneration, and a patient who suffers from alcoholic degeneration necessarily runs a much greater risk of heart failure during the course of acute fevers or from overwork, exhaustion, and an overloaded stomach, and the like, than does the man with a strong, healthy heart unaffected by alcohol or similar poisons."

It must be obvious that these words give a clue to the agency of alcohol in shortening the lives of tens of thousands of persons with whose decease the name of alcohol is never associated in the minds of their friends or in the death certificates.

Dr. Woodhead has this to say about the blood-vessels: "In chronic alcoholism in which the poison is acting continuously, over a long period, a peculiar fibrous condition of the vessels is met with; this, apparently, is the result of a slight irritation of the connective tissue of the walls of these vessels. The wall of the vessel may become thickened throughout its whole extent or irregularly, and the muscular coat may waste away as a new fibrous or scar-like tissue is formed. The

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wasting muscles may undergo fatty degeneration, and in these lime salts may be deposited; the rigid, brittle, so-called pipe-stem vessels are the result." Referring to these degenerated arteries, Dr. Welch says: "In this way alcoholic excess may stand in a causative relation to cerebral disorders, such as apoplexy and paralysis, and also the diseases of the heart and kidneys."

From our present standpoint it is particularly worthy of remark that Professor Woodhead states that this calcification of the blood-vessels is likely to occur in persons who have never been either habitual or occasional drunkards, but who have taken only "what they are pleased to call 'moderate' quantities of alcohol." Similarly, Dr. Welch declares that "alcoholic diseases are certainly not limited to persons recognized as drunkards. Instances have been recorded in increasing numbers in recent years of the occurrence of diseases of the circulatory, renal, and nervous systems, reasonably or positively attributable to the use of alcoholic liquors, in persons who never became really intoxicated and were regarded by themselves and by others as 'moderate drinkers.'"

"It is well established," adds Dr. Welch, "that the general mortality from diseases of the liver, kidney, heart, blood-vessels, and nervous system is much higher in those following occupations which expose them to the temptation of drinking than in others." Strümpell declares that chronic inflam-

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mation of the stomach and bowels is almost exclusively of alcoholic origin, and that when a man in the prime of life dies of certain chronic kidney affections, one may safely infer that he has been a lover of beer and other alcoholic drinks. Similarly, cirrhosis of the liver is universally recognized as being, nine times in ten, of alcoholic origin. The nervous affections of like origin are numerous and important, implicating both brain cells and peripheral fibers.

How the Poison Works

WITHOUT going into further details as to the precise changes that alcohol may effect in the various organs of the body, we may note that these pathological changes are everywhere of the same general type. There is an ever-present tendency to destroy the higher form of cells—those that are directly concerned with the vital process—and to replace them with useless or harmful connective tissue. “Whether this scar-tissue formation goes on in the heart, in the kidneys, in the liver, in the blood-vessels, or in the nerves,” says Woodhead, “the process is essentially the same, and it must be associated with the accumulation of poisonous or waste products in the lymph spaces through which the nutrient fluids pass to the tissues. In all cases the functions of the most highly devel-

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oped or most weakened cells are those first affected. Such cells become wasted and degenerated, and after this new tissue—never highly developed, indeed often of a very low type, corresponding to the white scar tissue that is seen in an old wound—comes to take their place. The contracting scar tissue of a wound has its exact homologue in the contracting scar tissue that is met with in the liver, in the kidney, and in the brain.”

It is not altogether pleasant to think that one's bodily tissues—from the brain to the remotest nerve fibril, from the heart to the minutest arteriole—may perhaps be undergoing day by day such changes as these. Yet that is the possibility which every habitual drinker of alcoholic beverages—“moderate drinker” though he be—must face. This is an added toll that does not appear in the first price of the glass of beer or bottle of wine, but it is a toll that may refuse to be overlooked in the final accounting.

Nor is the entire story told when we have shown that alcohol may attack specifically one and another of the vital organs, so that scarcely one is safe from its assaults. The malignant influence of this protean poison may make itself felt in a way still more subtle and, if possible, still more alarming. It may cause changes in those all-essential fluids, the blood and lymph, of so intimate a character as to defy the present powers of microscopist and chemist, yet of the utmost significance for the

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health and even for the life of the individual. Many practical physicians have long believed that alcohol lowers the "vitality" of a patient, making him more susceptible to disease. So distinguished a clinician as the late Dr. N. S. Davis—one of the most skilful practitioners and greatest teachers America has produced—believed and taught that alcohol is deleterious to the human system under all circumstances and in any quantity, in health or in disease. It remained for the laboratory workers of recent years to demonstrate how large was the measure of truth in his little-heeded contention.¹⁰

Alcohol and Acute Infections

THE demonstration has been made in connection with the experiments in which animals and men are rendered immune from certain contagious diseases through inoculation with specific serums. Deléarde, working in Calmette's laboratory in Lille, showed that alcoholized rabbits are not protected by inoculation, as normal ones are, against hydrophobia. Moreover, he reports the case of an intemperate man, bitten by a mad dog, who died notwithstanding anti-rabic treatment, whereas a boy of thirteen, much more severely bitten by the same dog on the same day, recovered under treatment. Deléarde strongly advises any one bitten by a mad dog to abstain from alcohol, not only during

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the anti-rabic treatment but for some months thereafter, lest the alcohol counteract the effects of the protective serum.

Similar laboratory experiments have been made by Professor T. Laitenan, who became fully convinced that alcohol increases the susceptibility of animals to splenic fever, tuberculosis, and diphtheria. Professor Laitenan's experiments have added interest because of the small quantities of alcohol used. The resistance of rabbits and guinea-pigs to infection was decreased and the vitality of their progeny lowered by doses of alcohol equivalent to that which a man would imbibe if he drank habitually no more than a half-pint daily of a mild ($3\frac{1}{2}$ per cent.) beer. Dr. Reid Hunt, of the United States Hygienic Laboratory, has shown the efficacy of small doses of alcohol in increasing the susceptibility of the animal organism to poisoning by metals, dyes, and other toxic substances. Dr. A. C. Abbott, of the University of Pennsylvania, made an elaborate series of experiments to test the susceptibility of rabbits to various micro-organisms causing pus-formations and blood-poisoning. He found that the normal resistance of rabbits to infection from this source was in most cases "markedly diminished through the influence of alcohol when given daily to a stage of acute intoxication." "It is interesting to note," Dr. Abbott adds, "that the results of inoculation of the alcoholized rabbits with the erysipelas coccus

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correspond in a way with clinical observations on human beings addicted to the excessive use of alcohol when infected by this organism."

Additional confirmation of the deleterious effects of alcohol in this connection was furnished by the cats and dogs of Professor Hodge's experiments, already referred to. All of these showed peculiar susceptibility to infectious diseases, not only being attacked earlier than their normal companions, but also suffering more severely. This accords with numerous observations on the human subject; for example, with the claim made years ago by McLeod and Milles that Europeans in Shanghai who used alcohol showed increased susceptibility to Asiatic cholera, and suffered from a more virulent type of the disease. Professor Woodhead points out that many of the foremost authorities now concede the justice of this view, and unreservedly condemn the giving of alcohol, even in medicinal doses, to patients suffering from cholera or from various other acute diseases and intoxications, including diphtheria, tetanus, snake-bite, and pneumonia, as being not merely useless but positively harmful. Even when the patient has advanced far toward recovery from an acute infectious disease, it is held still to be highly unwise to administer alcohol, since this may interfere with the beneficent action of the antitoxins that have developed in the tissues of the body, and in virtue of which the disease has been overcome.

The Ally of Tuberculosis

Nor many physicians, perhaps, will go so far as Dr. Muirhead, of Edinburgh, who at one time claimed that he had scarcely known of a death in a case of pneumonia uncomplicated by alcoholism; but almost every physician will admit that he contemplates with increased solicitude every case of pneumonia thus complicated. Equally potent, seemingly, is alcohol in complicating that other ever-menacing lung disease, tuberculosis. Dr. Crothers long ago asserted that inebriety and tuberculosis are practically interconvertible conditions—a view that may be interpreted in the words of Dr. Dickinson's Baillie Lecture: "We may conclude, and that confidently, that alcohol promotes tubercle, not because it begets the bacilli, but because it impairs the tissues and makes them ready to yield to the attacks of the parasites." Dr. Brouardel, at the Congress for the Study of Tuberculosis, in London, was equally emphatic as to the influence of alcohol in preparing the way for tuberculosis and increasing its virulence; and this view has now become general—curiously reversing the popular impression, once held by the medical profession as well, that alcohol is antagonistic to consumption.

Corroborative evidence of the baleful alliance between alcohol and tuberculosis is furnished by

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the fact that in France the regions where tuberculosis is most prevalent correspond with those in which the consumption of alcohol is greatest. Where the average annual consumption was 12.5 liters per person, the death-rate from consumption was found by Baudron to be 32.8 per thousand. Where alcoholic consumption rose to 36.4 liters, the death-rate from consumption increased to 107.8 per thousand. Equally suggestive are facts put forward by Guttstadt in regard to the causes of death in the various callings in Prussia. He found that tuberculosis claimed 160 victims in every thousand deaths of persons over twenty-five years of age. But the number of deaths from this disease per thousand deaths among gymnasium teachers, physicians, and Protestant clergymen, for example, amounted respectively to 126, 113, and 76 only; whereas numbers rose, for hotel-keepers, to 237, for brewers to 344, and for waiters to 556. No doubt several factors complicate the problem here, but one hazards little in suggesting that a difference of habit as to the use of alcohol was the chief determinant in running up the death-rate due to tuberculosis from 76 per thousand at one end of the scale to 556 at the other.

Pneumonia and tuberculosis combined account for one fifth of all deaths in the United States year by year. In the light of what has just been shown, it would appear that alcohol here has a hand in the carrying-off of other untold thousands with

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whose untimely demise its name is not officially associated. I may add that certain German authorities, including, for example, Dr. Liebe, present evidence—not as yet demonstrative—to show that cancer must also be added to the list of diseases to which alcohol predisposes the organism.

Alcohol and Longevity

VIEWING the subject from yet another standpoint, I wish briefly to present evidence drawn from the experience of certain life-insurance companies, where statistics as to abstainers from alcohol have been kept along with those for such moderate users as are considered fair “risks.” A comparison of the figures proves how markedly abstinence from alcohol enhances the average chance that any individual will attain long life. The most comprehensive records available are those of the United Kingdom Temperance and General Provident Institution of Great Britain. These cover a period of more than forty years. The institution was founded at a time when a teetotaler was supposed to be a worse risk than a moderate drinker. It was, indeed, founded as the result of the efforts of a young Quaker, Robert Warren by name, who objected to being penalized with larger life-insurance premiums than the ordinary because he was a total abstainer. The records of the com-

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pany divide all its members into two classes—abstainers and moderate drinkers. The statistics, as presented by the actuary, Mr. R. M. Moore, show that in forty years (1866–1905) the temperance section had only 7487 death claims filed out of 10,463 “expected” claims; whereas in the general section (moderate drinkers) there were 12,811 death claims out of 13,514 “expected” claims. Stated otherwise, the deaths among total abstainers were but 71.54 per cent. of the calculated probabilities of death; whereas among the moderate drinkers the deaths were 94 per cent. of the calculated probabilities.¹¹

The Sceptre Life Insurance Association, founded in 1864, shows similar figures. Summarizing these along with the experiences of other companies, the medical officer of the Sceptre Company, W. M. Eccles, F.R.C.S., asks three pertinent questions and deduces answers as follows:

“(1) Does the excessive use of alcohol tend to shorten life? The answer to this, from the universal experience of [life-insurance] offices, is that the excessive use of alcohol undoubtedly shortens life.

“(2) Does alcohol taken in moderation affect the probabilities of a lengthy life? The answer to this query is that an increasing number of statistics over an increasing number of years show that even a moderate amount of alcohol habitually taken tends to shorten life.

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“(3) Do total abstainers from alcohol show a distinctly greater longevity than any other class of the community? The answer to this question must now be in the affirmative.”

In regard to the value of the evidence thus gathered by life-insurance companies, I cannot do better than to quote from a very interesting letter written me by a practical insurance manager, Mr. Edward A. Woods, of Pittsburgh:

“I think,” says Mr. Woods, “that the figures of life-insurance companies on the effect of total abstinence are the most convincing and valuable figures there are, for these among other reasons:

“(1) They are gathered on a scientific basis; they are the actual experience of life-insurance companies, giving the actual longevity of abstainers and non-abstainers over a long period of years and covering such a number of lives as to be a conclusive demonstration and free of the charge of being isolated cases.

“(2) No one can accuse the life-insurance companies throughout the world of having a temperance bias. On the contrary, the interest of the life-insurance company is to show, if possible, that drinking does not affect longevity seriously enough to cause the company to exclude the large numbers of possible customers that are now excluded. It is within the knowledge of every insurance underwriter that nearly 40 per cent. of the cases rejected by life-insurance companies are

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for causes connected with alcohol. The loss of this business would be avoided if companies could believe that alcohol did not have a seriously adverse effect upon longevity.

“(3) It is interesting, too, to note that, so far as I have been able to learn, actuaries of all companies of all countries in all parts of the world absolutely concur in their conclusions that total abstainers live longer than temperate people, unanimity of experience adding strength to the argument. Again, it is important to note that the classifying by life-insurance companies of abstainers and non-abstainers is not a contrast between abstainers and free drinkers, because so far as companies can exclude free drinkers they are not insured at all; consequently the comparison is between temperate persons—not total abstainers—and abstainers. Few reputable companies will insure a man at all if they know he ever becomes intoxicated or is a free user of liquor. Therefore, if it is shown that abstainers live longer than other insured persons, it is comparing the abstainers with a very temperate class.

“It is interesting in this connection to note that even those once free drinkers who have reformed have a very heavy mortality. There has been published the experience, recently collected, of the American life-insurance companies of their mortality upon persons who have reformed from, or taken a cure for, the liquor habit. Any one who

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knows how careful companies are about insuring any one who has ever had this habit knows what carefully selected cases they must have been to have been accepted at all. They must have been those who, the companies had every reason to believe, notwithstanding their admitted past habits as to alcohol, were still so reformed and had been reformed so long that they could be insured. Yet the companies' mortality experience upon such men has been particularly disastrous, having been 125.5 per cent. of expected mortality—an excess of 25.5 per cent.—and, further, this heavy mortality came very early after insurance, the mortality being 36 per cent. the first five years of such insurance and on young ages—fifteen to twenty-eight—being 60.7 per cent. excessive.

“There may be some actuary in the world who believes that total abstainers do not live as long as non-abstainers, but I never heard of one, and I have never seen any figures showing an advantage in favor of abstainers of less than 21 per cent. Certainly adding one fifth to a man's life makes it worth while to forego one class of food or drink. Some years ago I secured an opinion of an actuary on the expectation of life of a young man of twenty who was a total abstainer and one who was a drinking man at that age. The expectation of the abstainer was 42.2 years; of the drinking man 15.”

Mr. Woods adds:

“I have many other statistics on the effect of alcohol on longevity, not only as to the users of alcohol, but the sellers. For example, the fact that the mortality of brewers between the ages of fifty and sixty is about three times that of persons in ordinary occupations; in fact, the mortality of liquor-dealers is greater than that of almost any other occupation, ranking with that of soldiers of the regular army and sailors on the high seas, both of which occupations, in turn, are also affected by the use of alcohol. My information is mostly the actuarial data or addresses of actuaries and medical examiners. C. P. Huntington, of the New York Life Insurance Company, states that the mortality of those engaged in the manufacture of liquor at the ages between fifty and sixty is three times that of the ordinary, and this applies quite as much to the owners of breweries as to the people working in them. The Connecticut Mutual Life Insurance Company published some years ago mortality tables showing the mortality of 97,787 lives, divided into forty-seven classes. Among professors and teachers the mortality was but 61 per cent. of the expected; lawyers 79 per cent.; manufacturers 81 per cent.; among liquor-dealers, the forty-fifth class, immediately preceding mariners and seamen, the mortality was 142 per cent. of the expected.”

All this, it may be said, is precisely in line with what might be expected from the direct testimony

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as to the effects of alcohol already presented; but it is highly interesting and important evidence because it approaches the subject from a point of view totally different from that of either the laboratory experimenter or the bedside physician; yet it fully substantiates and confirms their results.

Hereditary Effects of Alcohol

If additional evidence of the all-pervading influence of alcohol is required, it may be found in the thought-compelling fact that the effects are not limited to the individual who imbibes the alcohol, but may be passed on to his descendants. The offspring of alcoholics show impaired vitality of the most deep-seated character. Sometimes this impaired vitality is manifested in the non-viability of the offspring; sometimes in deformity; very frequently in neuroses, which may take the severe forms of chorea, infantile convulsions, epilepsy, or idiocy.

In examining into the history of 2552 idiotic, epileptic, hysterical, or weak-minded children in the institution at Bicêtre, France, Bourneville found that over 41 per cent. had alcoholic parents. In more than 9 per cent. of the cases it was ascertained that one or both parents were under the influence of alcohol at the time of procreation—a

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fact of positively terrifying significance, when we reflect how alcohol inflames the passions, while subordinating the judgment and the ethical scruples by which these passions are normally held in check. Of similar import are the observations of Bezzola and of Hartmann that a large proportion of the idiots and criminals in Switzerland were conceived during the season of the year when the customs of the country—"May-fests," etc.—lead to the disproportionate consumption of alcohol.

Experimental evidence of very striking character is furnished by the reproductive histories of Professor Hodge's alcoholized dogs. Of 23 whelps born in four litters to a pair of tipplers, 11 were born dead or non-viable, 8 were deformed, and only 4 were seemingly normal. Meantime, a pair of normal kennel-companions produced 45 whelps, of which 41 were viable and normal—a percentage of 90.2 against the 17.4 per cent. of viable alcoholics. Professor Hodge points out that these results are strikingly similar to the observations of Demme on the progeny of ten alcoholic as compared with ten normal families of human beings. The ten alcoholic families produced 57 children, of whom 10 were deformed, 6 idiotic, 6 choreic or epileptic, 25 non-viable, and only 10, or 17 per cent. of the whole, were normal. The ten normal families produced 61 children, 2 of whom were deformed, 2 pronounced "backward," though not

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suffering from disease, and 3 non-viable, leaving 54, or 88.5 per cent., normal.

As I am writing these lines, the latest report of the Craig Colony for Epileptics, at Sonyea, New York, chances to come to my desk. Glancing at the tables of statistics, I find that the superintendent, Dr. William P. Spratling, reports a history of alcoholism in the parents of 313 out of 950 recent cases. More than 22 per cent. of these unfortunates are thus suffering from the mistakes of their parents. Nor does this by any means tell the whole story, for the report shows that 577 additional cases—more than 60 per cent. of the whole—suffer from “neuropathic heredity”; which means that their parents were themselves the victims of one or another of those neuroses that are peculiarly heritable, and that unquestionably tell, in a large number of cases, of alcoholic indulgence on the part of their progenitors. “Even to the third and fourth generation,” said the wise Hebrew of old; and the laws of heredity have not changed since then.

I cite the data from this report of the Epileptic Colony, not because its record is in any way exceptional, but because it is absolutely typical. The mental image that it brings up is precisely comparable to that which would arise were we to examine the life histories of the inmates of any institution whatever where dependent or delinquent children are cared for, be it idiot asylum,

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orphanage, hospital, or reformatory. The same picture, with the same insistent moral, would be before us could we visit a clinic where nervous diseases are treated; or—turning to the other end of the social scale—could we sit in the office of a fashionable specialist in nervous diseases and behold the succession of neurotics, epileptics, paralytics, and degenerates that come day by day under his observation. It is this picture, along with others which the preceding pages may in some measure have suggested, that comes to mind and will not readily be banished when one hears advocated “on physiological grounds” the regular use of alcoholic drinks “in moderation.” A vast number of the misguided individuals who were responsible for all this misery never did use alcohol except in what they believed to be strict “moderation”; and of those that did use it to excess, there were few indeed who would not have restricted their use of alcohol to moderate quantities, or have abandoned its use altogether, had not the drug itself made them its slave by depriving them of all power of choice. Few men indeed are voluntary inebriates.

Alcohol and the “Moderate” Drinker

It does not fall within the scope of my present purpose to dwell upon the familiar aspect of the

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effects of alcohol suggested by the last sentence. It requires no scientific experiments to prove that one of the subtlest effects of this many-sided drug is to produce a craving for itself, while weakening the will that could resist that craving. But beyond noting that this is precisely in line with what we have everywhere seen to be the typical effect of alcohol—the weakening of higher functions and faculties, with corresponding exaggeration of lower ones—I shall not comment here upon this all too familiar phase of the alcohol problem. Throughout this chapter I have had in mind the hidden cumulative effects of relatively small quantities of alcohol, rather than the potent effect of excessive indulgence. The experiments described are in the main such as have been conducted with the use of quantities of liquor more or less corresponding to those that may be habitually taken by a “moderate” drinker. The pathological effects of alcohol recorded are chiefly such as may impress themselves on the system of one who seldom or never takes alcohol to obvious excess. It will be observed that I have said nothing of that terrible psychosis known as acute intoxication; that I have drawn no picture of the occasional or the habitual inebriate. I have not so much as referred to the statistics that show how largely the asylums, the almshouses, and the prisons throughout Christendom are filled by the victims of alcoholic excess.

My own special studies might naturally have

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tempted me to dwell from the outset on this aspect of the subject. But I have refrained from so doing because I have aimed first to present certain aspects of the alcohol question not from a sociological standpoint but as bearing on the habits of the individual. I have had in mind the voluntary "social" drinker rather than the drunkard. I have wished to raise a question in the mind of each and every habitual user of alcohol in "moderation" who chances to read this chapter, as to whether he is acting wisely in using alcohol habitually in any quantity whatever. I have wished to raise this question, not through argument or the use of rhetoric, but by a simple presentation of well-ascertained scientific facts.

If in reply the reader shall say, "There is some quantity of alcohol that constitutes actual moderation, some quantity that will give me pleasure and yet not menace me with these evils," I answer thus:

Conceivably that is true, though it is not proved. But, in any event, no man can tell you what the safe quantity is—if safe quantity there be—in any individual case. We have seen how widely individuals differ in susceptibility. In the laboratory some animals are killed by doses that seem harmless to their companions. These are matters of temperament that as yet elude explanation. But this much I can predict with confidence: whatever the "safe" quantity of alcohol for you to take, you will unquestionably at times

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exceed it. In a tolerably wide experience of men of many nations, I have never known a habitual drinker who did not sometimes take more alcohol than even the most liberal scientific estimate could claim as harmless. Therefore I believe that you must do the same.

So I am bound to believe, on the evidence, that if you take alcohol habitually, in any quantity whatever, it is to some extent a menace to you. I am bound to believe, in the light of what science has revealed: (1) that you are tangibly threatening the physical structures of your stomach, your liver, your kidneys, your heart, your blood-vessels, your nerves, your brain; (2) that you are unequivocally decreasing your capacity for work in any field, be it physical, intellectual, or artistic; (3) that you are in some measure lowering the grade of your mind, dulling your higher esthetic sense, and taking the finer edge off your morals; (4) that you are distinctly lessening your chances of maintaining health and attaining longevity; and (5) that you are entailing upon your descendants yet unborn a bond of incalculable misery.

Such, I am bound to believe, is the probable cost of your "moderate" indulgence in alcoholic beverages. Part of that cost you must pay in person; the balance will be the heritage of future generations. As a mere business proposition: Is your glass of beer, your bottle of wine, your high-ball, or your cocktail worth such a price?



CHAPTER II

ALCOHOL AND THE COMMUNITY

THE preceding chapter dealt with the effects of alcohol upon the individual. It was pointed out that such widely varying bodily tissues as those of the brain, the nerves, the heart and blood-vessels, the stomach and intestinal tract, the lymphatic system, the kidneys, and the liver may become diseased as a direct effect of the habitual ingestion of even small quantities of alcohol, whether taken in the form of beer, wine, whisky, or other beverage. It was shown also that the deleterious consequences are not confined to the habitual drinker himself, but are passed on, variously modified or intensified, to his individual descendants of successive generations.

We have now to examine the subject from a changed point of view, considering not so much the individual as the human society of which he forms a unit. We shall deal, therefore, with the facts of a quite different order, showing the disturbances produced by alcohol in the social organism, which will be found to be strikingly suggestive, whether considered from the standpoint of the humanitarian or from that of the

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political economist. We shall find that the effects of alcohol upon the community as a whole are as varied and characteristic as we have seen its effects to be upon the individual organism.

As preliminary to this, however, it may be of interest to inquire a little more fully into the method of action of alcohol, with an eye to the explanation of its protean activities; and in particular to make clear its specific effects upon the nervous system, since upon these effects the chief measure of its evil influence depends.

The primal fact seems to be that alcohol has an affinity, not for any particular highly organized tissue of the body, but for protoplasm itself, which is the basis of all living matter. To gain a clear mental picture of its action on the body, one may liken the effect of alcohol circulating in the blood to that of a current of water coursing along the bed of a stream. Every portion of the bed of the stream is to some extent affected by the abrading force of the current. But some portions are affected far more than others. A granite boulder, for example, seems to escape almost unscathed, whereas a limestone surface is gradually cut and furrowed, and a sand-bed or a muddy deposit may be swept away altogether. The difference is due not at all to the current of water, but to inherent differences in the surfaces acted upon; the stream washed against granite, limestone, sand, and mud quite impartially.

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In much the same way the alcohol circulating in the vascular currents of a human organism tends to attack one tissue and another. The precise effect, in the case of any given organism, depends upon the relative stability of the various tissues of that organism. If the cells of the liver, for example, chance to be relatively weak and susceptible, the liver will be the organ most conspicuously "attacked" by the alcohol. In other cases kidneys or heart or nervous tissues may be the ones to suffer most because they chanced to be the tenderest—the most easily abraded—tissues. It can hardly be said that alcohol singled them out for its attack: their inherent weakness is the cause of their destruction, just as the inherent softness of the sand-bank explains its abrasion by the stream. The affected cells cease to functionate normally in the presence of the disturbing influence of the alcohol. They no longer take up oxygen and other nutrients and give off waste products in the usual proportion. Ultimately, as we have seen, they may degenerate into useless fatty or scar-like tissues.

Though the observed effects are thus so unequivocal, the theoretical explanation of the exact method of operation of the alcohol in producing these effects is not satisfactory to all physiologists. We are here concerned with facts rather than with mere theories, and it is no more incumbent on us to explain the precise rationale of alcohol's attack

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on the tissues before we can admit its consequences than it would be incumbent on us to explain the physical and chemical effects of moving water upon limestone before one could admit that a given stream had cut its way through a ledge of rocks to form a gorge or cañon. But there is always an added satisfaction in being able to visualize, so to say, the process by which a given effect is produced, and in the case of alcohol a plausible, even if not an absolutely certain, explanation has been suggested. It may be of interest to present the explanation here in the words of a high authority, Professor G. Sims Woodhead, of Cambridge University, whom I previously quoted in describing the perverted tissues themselves.

“Alcohol,” says Professor Woodhead, “may be classed with those poisons produced by the lower vegetable organisms which act directly upon protoplasm. These poisons combine readily and rapidly with oxygen, and it appears that combining power is so great that oxygen, which under normal conditions would combine with the tissues, combines with alcohol. Further, alcohol appears to have power of so altering the tissues that they themselves become less capable of taking up some proportion of the oxygen, which is thus more at the disposal of the poison. The ‘oxygen hunger’ of these poisons is so great that when they are taken into the body they interfere with the oxidation of the fat and carbohydrates along with which

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they are ingested. It is maintained that the oxygen taken up by the blood in its passage through the lungs is rapidly seized upon by these poisons, alcohol amongst them, as they circulate in the blood, and, combining with them, little or none is left for the tissue protoplasm, and the nutritional processes are thus greatly interfered with. Further, owing to this interference with the nutrition of the protoplasm, there is a serious disturbance in the processes of excretion of the waste products, which, accumulating in the tissues, exert a further poisonous action on the protoplasm."

In the light of such an explanation of the effects of alcohol, it will be obvious how one-sided a presentation of truth is given in the claim sometimes made that alcohol is a veritable food because it is oxidized or burned in the body. Burned it unquestionably is, but the concomitant effects of that oxidation are obviously very different from those that attend the oxidation of a legitimate foodstuff.

Let me repeat that the precise validity of this theoretical explanation of the action of alcohol does not in the least affect the presentation of facts previously given nor the picture just presented of the alcoholic poison attacking various tissues of the body in virtue of their relative weakness or instability. These are clearly observed matters of fact, quite independent of theories. Indeed, to say that the weakest tissue is the one

most potently disturbed in function might almost be said to be a physiological axiom, or at least a familiar truth of the same order with the observation that the softest portions of the river-bed will be most abraded by the current of water. I have emphasized the point here, however, both because not all my readers are supposed to be physiologists, and because I wish to make an application of the principle that will be of great aid in explaining the far-reaching effects of alcohol as a disturbing influence in human society.

How Alcohol Attacks the Brain

THE application in question is based on the fact, familiar to every student of evolution, that, generally speaking, the most unstable tissues of an organism are the ones most recently evolved; that is to say, the most highly developed and complex tissues. Being interpreted, this means that the most delicate and unstable of all organic tissues are the complex central nerve cells of the gray cortex of the brain—the cells directly associated with the exhibition of mental processes. These are the most delicately poised, the most easily disturbed in function, of all organic tissues. It follows that these are the tissues that come earliest and most persistently under the influence of the alcoholic poison as it courses through the vascular

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channels. A given individual may have a highly susceptible liver or kidney or heart, through hereditary influences or through some peculiarity of his environment; but in general the brain—the organ of mind—is the organ whose tissues are most susceptible. So when the dissecting-knife reveals, post mortem, a hob-nailed liver or an alcoholic kidney, stomach, or heart, it will almost invariably reveal also a shrunken and “watery” alcoholic brain. And in numberless cases in which all the other organs have seemed to present a granite-like resistance to the poison, the brain alone gives evidence of having yielded to the strain.

Experiments upon animals have fully corroborated these observations of the pathologist. Dr. Berkley made microscopical examination of the tissues of many rabbits suffering from acute intoxication, the animals being those used in Dr. Friedenwald's experiments conducted at Johns Hopkins University in behalf of the Committee of Fifty. Some of the animals had been given but a single large dose of alcohol. The one significant lesion that the microscope revealed in these cases was a lesion of central nerve cells and their processes. Within the substance of the affected cells, the granular matter normally present was visibly disintegrated. The delicate little fibrils that lead out from the cells showed irregular nodules or swellings not normally present, whereas their

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normal bud-like projections had partially disappeared.

Nerve cells thus demonstrably affected by acute intoxication have been found not only in various portions of the brain, but in the spinal cord and in the ganglia of the sympathetic nervous system. Only a portion of the cells are affected in any given case; but the demonstrable changes begin to appear within a few minutes after the alcohol is taken. The lesions, though profound, are not permanent, as shown by the fact that they are not present in the nerve cells of animals that have fully recovered from acute intoxication.

The precise relation between these lesions of the nerve cells and the mental symptoms of acute intoxication is matter for the speculations of the physiological psychologist. For our present purpose it suffices that the lesions demonstrably exist; that they are unquestionably due to the direct effects of alcohol; and that they involve not merely the "organ of thought" in all of its essential structures (cerebrum, cerebellum, pons, and medulla oblongata), but also the "sympathetic" system which is so closely associated with the unconscious and subconscious activities of the heart and blood-vessels and of the digestive and assimilative systems.

That such structural changes are associated with perversions of function all along the line of nervous activities connected with the cells in-

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volved, no one can doubt. Therefore these observations of the microscopist show that the subtle alcoholic poison, while pervading the blood-currents and thus bathing every tissue of the body, may exert a secondary influence upon the remotest cell of every organ through the channel of the all-controlling nerves. Our present concern, however, is with the nerve cells themselves, or rather with the concomitant changes in mentality that accompany their lesions. These mental changes, of course, rather than any lesions of bodily organs, give alcohol its importance as a disturbing factor in the body politic. Let us briefly examine, then, the nature of these changes.

The Impairment of Mind and Morals

A KEY to the entire subject has already been supplied us, through the experiments cited in the preceding chapter, and through the principle of evolution just named. The practical observations of the one and the theoretical considerations of the other concur in leading us to expect that the effect of alcohol, stated in general terms, will be evidenced most conspicuously by impairment of the highest functions of mind. The direct observation of persons under the influence of intoxicating quantities of alcohol fully confirms this expectation. Such persons show (1) marked impairment

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of those powers of inhibition and self-restraint that we call volitional control or will-power; (2) serious modification of the capacity to make sound and logical judgments; and (3) a distinct blunting of the moral sensibilities. The precise symptoms of these general impairments vary, naturally enough, with the individual bias of mind. One man becomes hilarious and optimistic; a second, lacrymose and sympathetic; a third, sullen, revengeful, and pugnacious; but these various modifications of personality are all explicable in general terms as due to impairment of the higher functions of volition, of judgment, and of moral sense.

In effect, the intoxicated person is subjected to a rapid process of devolution; he loses the higher and more intricate associations of ideas that are the badge of recent civilization, and reverts to a remote ancestral stage of development. The basal passions that come as a heritage from unnumbered generations of barbaric ancestors are relatively unimpaired, and they become obtrusively manifest in proportion as the restraints that constitute the veneer of recent civilization are removed.

The degree of mental perversion that may thus be rapidly induced by a single large potation of an alcoholic beverage is not more remarkable than the rapidity with which normal conditions are restored when the alcohol has been completely eliminated from the system. Ordinarily, after the

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lapse of a few days, all symptoms of acute poisoning disappear: brain and mind are restored to precisely their antecedent conditions, so far as any known tests could determine. Yet in reality subtle changes have been effected that are ineradicable. These changes are infinitesimal in amount, and they could not be demonstrated by the crude apparatus at command even of the physiological psychologist; but they are clearly enough demonstrable by a process of reasoning, since it is only by assuming the piling up of a series of such infinitesimal changes that we can account for the gradual transformation of a normal mind into the helpless mind of a chronic inebriate.

The person whose mind has passed through this most pitiful of transformations was in the beginning quite "master of himself"; he could "take a drink or leave it" at will; if he sometimes drank to the point of intoxication, he did so voluntarily, confident that he could discontinue the use of liquor altogether at any time when he should decide that it was in any way permanently harmful to him: but in the end he takes alcohol in response to an imperative craving that has the force of an organic necessity; he is utterly powerless to abstain from taking it, though he knows that it is destroying his mind and body and shutting him off from all that in saner moments he accounts dear in life.

Such a transformation, I repeat, can be ac-

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counted for only by assuming that each individual drink of alcoholic beverage had its modicum of permanent influence upon the organism; just as each individual drop of water has its share in wearing the stone, though its influence cannot be directly measured. The number of drops that must fall upon the stone before a measurable effect is produced depends upon the hardness of the stone itself; and the number of ounces of alcohol that must act upon an individual brain to produce measurable permanent impairment of that brain varies in the same way and for the same reason. But as no stone is absolutely impervious to water, so no brain is absolutely resistant to alcohol. One brain may differ from another in susceptibility, through inheritance and training, as widely as granite differs from chalk in hardness; but the most stable brain is only relatively, not absolutely, immune.

It follows, obviously enough, that among a large company of habitual drinkers every gradation of impairment of mind must be represented. Laboratory experiments and practical experiences already cited suggest how enormous in the aggregate is the deduction from the sum total of physical and mental work that mankind might normally perform that must be ascribed to the use of alcohol even when not taken in "excess." But we are now concerned with an even more tangible aspect of the subject. We have to inquire what

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definite practical manifestations of abnormality are given by the more susceptible modicum of brains under the influence of alcohol, and to what extent these abnormalities exert a disturbing influence in the orderly course of human society.

Alcohol and Insanity

THE question that first presents itself is as to whether alcohol in attacking the brain cells produces or tends to produce such mental changes as constitute technical insanity. By common consent of layman and specialist alike, there is no more dreadful affliction from which any individual can suffer than mental overthrow. To what extent is alcohol a cause of this affliction? For answer we turn to the statistics of institutions for the insane, and to the writings of alienists. There is nothing in the least uncertain about the character of the reply.

Here, for example, is the latest Annual Report of the New York State Commission in Lunacy. It presents a colored diagram showing at a glance the percentage of insane patients known to have history of alcoholism who were admitted during the year 1907 to the State asylums. The colored portion representing alcoholism covers a full third of the area in the case of patients from the rural districts, and more than a third in the case of

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urban districts. The explanatory text accompanying the diagram notes that there remains a good deal of uncertainty in many cases as to the precise share played by alcohol in association with other causes, but it concludes with this significant statement: "As the prevention of alcoholism has a very definite relation to the prevention of insanity, a detailed study of the controllable conditions which favor intemperance may prove a fruitful field to those who are interested in the latter work."

The asylum statistics of other States reiterate the same lesson. Considering the United States as a whole, it is variously estimated that from 25 to 30 per cent. of all the insane patients admitted to the asylums year by year owe their misfortune directly or indirectly to the abuse of alcohol. The statistics of other countries are closely similar. In England and Wales, according to the estimate of Dr. Robert Jones, alcohol claims 17,000 victims among an asylum population of 116,000. Dr. Clouston, superintendent of the Royal Edinburgh Asylum, in Scotland, reports that 42 per cent. of the men and 18 per cent. of the women under his charge are victims of intemperance. He notes, it may be added, that these figures have more than doubled within the past thirty years; and in particular that drunkenness as a cause of insanity in women has increased of late years with unexampled rapidity—an alarming observation that is

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fully confirmed by Dr. Tuke's experience at the Royal Dundee Asylum.

Another famous British alienist, Dr. Theodore B. Hyslop, physician superintendent to the royal hospitals of Bridewell and Bethlem—the once notorious “Bedlam”—near London, comments as follows: “With regard to insanity there is some difference in experience as to the relative frequency of alcohol in its causation. This difference ranges from 10 to 30 per cent. When, however, we consider the effects of alcohol in producing poverty, in rendering an individual prone to acquire specific disease, and in bringing about the numerous other factors of the causation of insanity, and when we recall the frequent instances in which alcoholism in one member of a family has carried other members into a condition of insanity, we realize that it is well-nigh impossible to fully estimate its baneful influence. My own experience leads me to believe,” concludes Dr. Hyslop, “that alcohol is either a direct or an indirect factor in the causation of at least 50 per cent. of the cases of insanity.” Speaking from a wide practical experience, Dr. Hyslop declares that “if we are to maintain our health, our morals, and our sanity, we must set ourselves with renewed vigor to the task of averting disaster by overcoming the curse of alcoholism.”

The testimony of Continental alienists is no less unequivocal, and the statistics upon which their

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opinions are based are no less suggestive as to the alarming increase in the ravages of alcohol in recent years. Thus the official returns from the Asylum of St. Anne, in Paris, for the period 1872-85 show that of 31,733 insane patients 28 per cent. of the men and less than 6 per cent. of the women owed their condition to alcoholism. But of the patients in the same institution in the year 1900, according to Dr. Legrain, no fewer than 51 per cent. of the men and 22 per cent. of the women were alcoholics.

Altogether similar are the returns from the asylum of Vienna. According to Tilkowski, 14,391 insane patients were under treatment there during the period 1871-82; and of these 25 per cent. of the men were the victims of alcohol. At the International Congress against Alcohol held in Vienna in 1901, it was shown that the corresponding percentages for these institutions had grown to over 31 per cent. for the period 1885-96. For the years 1894 and 1895 the figures rose to just over 40 per cent. "It is well known," comments Dr. Tilkowski, "that the abuse of alcohol constitutes one of the most important causes, and, indeed, in the large cities distinctly the most important cause, of mental diseases among men."

Be it noted that these statistics and this testimony come from a land where the chief alcoholic beverage is a light and supposedly innocuous beer.

The returns from that other stronghold of beer,

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the German Empire, are no less conclusive. Drs. Baer and Laquer report that in the asylums for the insane in Prussia, in the years 1880-83, the proportion of alcoholics among the male patients was 30-32 per cent. In 1886 the proportion had risen to 35 per cent.; in 1887 to 37 per cent.; in 1888 to 40 per cent. If cases of congenital idiocy were included in the estimate, the power of alcohol made itself felt, in the last-named year, to the extent of 45.5 per cent. The reports of individual asylums of Prussia are altogether confirmatory. Thus Dr. Nasse, at Siegburg, found alcohol a factor in the causation of insanity among 27 per cent. of the male patients in the institution; Dr. Jung, in Lebus, places the figure at 25 per cent. of all admissions; and Dr. Pelman, at Gräfenberg, reports 22 per cent. of male patients in the same category. Taking North German asylums as a whole, Dr. Finkelnburg, as quoted by Drs. Baer and Laquer, estimates that at least 25 per cent. of male patients demonstrably owe their mental overthrow to alcohol.

The last-named authorities note that the number of alcoholics among the insane is particularly large in the larger cities of the realm. Thus in one Berlin asylum (at Herzberg), in 1898-99, the proportion was 50.3 per cent. for men and 6.2 per cent. for women; in another (at Dalldorf), in the same years, 44.7 per cent. for men and 8.4 per cent. for women; in Dresden, during the pe-

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riod 1890-1900, 33 per cent. for men. In Munich the report of Kraepelin's Clinic for Mental Diseases for the year 1905 shows 30.3 per cent. of alcoholics among the men and 5.6 per cent. among the women. In Württemberg statistics for the year 1875 showed alcoholism among 48.73 per cent. of all the insane, male and female. Dr. Stark reports among the insane of Lower Alsace 26.6 per cent. of alcoholics; among those of Upper Alsace 32.3 per cent. In a word, from all parts of the German Empire comes the same story; and it seems clear that Dr. Stark's estimate that at least 25 per cent. of all the insane men in Germany are victims of alcoholism is a conservative estimate.

The Conservatism of Statistics

LET me add a word, however, about the significance of precise statistics. Few people who have not had practical experience in the matter can be aware how difficult it is to secure from the friends of patients brought to an institution for mental diseases a correct history of the patient's habits of life, where these have departed from the exemplary. Where alcoholism or the hereditary taint so often associated with it is in question, it is peculiarly difficult to get at the facts of the case. A reminiscence of the old idea that mental derange-

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ment implies, if not exactly a curse, at least a reproach, still lingers in the popular mind; and the friends appear to think it almost a point of honor to find some tangible cause for the affliction that will reflect no discredit upon either themselves or the patient.

In illustration of what I mean, let me cite from the statistical tables in a recent report of the Craig Colony for Epileptics, to which I have already referred in another connection. The tables show first the "assigned" cause of epilepsy in 950 cases admitted to the institution in a given period; then the probable cause as ascertained by the physicians of the institution after a careful investigation. Among the "assigned" causes, accidental injury to the patient holds first place, accounting for 102 cases; fright or shock accounts for 88 cases; indigestion for 66; dentition for 32; overwork for 13; and there is a scattering list of such alleged causes as overstudy, excitement, measles, punishment at school, hazing, inhaling gas, shock from electricity, smelling of cigarette smoke, and riding in a train. Heredity is named in only 23 cases, and alcoholism in but 12, and cerebral palsy (often associated with alcoholic heredity) in 10. But in the list of probable causes as investigated by Dr. Spratling, heredity accounts for not 23 but 469 of these cases; cerebral palsy for 135; and alcoholism in the parents is shown to exist in 213 cases. In a word, most of the alleged causes dis-

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appear altogether; and in their place appear family histories that the friends wished to disguise.

Doubtless in many cases the family physician good-humoredly connived at what seemed a harmless deception, forgetting that an accurate knowledge of the cause of a disease is a step toward cure of the disease. It is often difficult for the physician to put on record the facts of such a case without giving what seems to him needless offense to the patient's friends. To say frankly, in committing an insane patient to an asylum, that the cause of the mental overthrow was inherited instability of the nervous system due to alcoholism in a parent may seem almost like the violation of professional secrecy. Hence the physician very often reserves the vital bit of information, and, in deference to the scruples of the family, names "illness" or "overwork" or "indigestion"—any one of which may indeed have been a contributory factor—as if it were the sole cause. Such an equivocation, actuated by a desire to spare the feelings of the patient's friends, need not be too harshly condemned; but it adds enormously to the difficulties of the statistician.

But again, in many cases alcoholism is only one of several causative factors in producing mental overthrow, and the physician may feel fully justified in giving the patient the benefit of the doubt, so to speak, to the extent of maintaining

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silence on this one point. Sometimes he is able to argue with justice that intemperance may have been a result of mental disease rather than its cause, for such it assuredly may be in exceptional instances. But, in any event, the net result is that in a very large number of cases where a history of alcoholism in the patient or his ancestors complicates a case of insanity, no knowledge of that history comes to the physicians of the asylum to which the patient is sent for treatment. The different degrees of zeal exercised by different physicians in striving to investigate these histories account in considerable measure for the varying statistics of different asylums.

But the vital point I would have the reader bear in mind is this: any error in the statistics as to the share of alcohol in producing insanity is sure to be on the conservative side, since many family histories will remain obscure after the fullest practicable investigation, whereas very few cases indeed will be ascribed to intemperance unless there is clear and positive evidence for such ascription. When, therefore, we find the investigators of many lands ascribing to alcohol a causative relation in from 25 to 50 per cent. of all cases of insanity, we need not be very greatly concerned as to discrepancies in the exact figures of the various estimates, but may advantageously reflect that the lowest figures are quite startling enough, and that even so these figures, in any

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given case, are almost certain to understate rather than to overstate the truth.

It must be obvious that similar difficulties are to be met in determining the precise influence of alcohol upon other social conditions. The criminal and the pauper, for example, do not, as a rule, admit that their downfall was due to alcohol so long as they can conceal the fact; hence the statistics that deal with alcohol and crime and with alcohol and pauperism must be expected to lack something of complete reliability, but also to err only on the side of conservatism. Let no quibbler who makes capital of the unreliability of the statistics blind you to the all-essential fact that where the records of prisons, of almshouses, and of charitable organizations depart from entire accuracy as to the effect of alcohol in its relation to crime and to pauperism, they err in understatement, and in the nature of the case (if honestly compiled, as no one doubts that they usually are) can err on this side only. Bearing this thought in mind, let us examine briefly the statistics in question.

Alcohol and Crime

ACCORDING to the modern view, criminality implies, to some extent, defective mentality. A man with normal mental vision realizes intuitively that a law-abiding course enhances his own interests as

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well as those of the community. If he departs from such a course, it is only under the stress of an unusual temptation, or at a time when his judgment is impaired, in particular that judgment as to social relations which we commonly speak of as "moral sense." Now, as we have seen, it is a characteristic effect of alcohol to produce impairment of this highest mental faculty, while at the same time stimulating various lower propensities and passions. We might infer almost without argument, therefore, that an agent which inflames the passions and lowers the moral sense must make for the commission of crime. This inference, as regards alcohol, is abundantly justified by every-day experience; yet comparatively few people appreciate the full potency of this agent in interfering with the orderly course of society. It is rather startling, for example, to read the declaration of a lord chief justice of England that, "if sifted, nine tenths of the crime of England and Wales could be traced to drink." But when we examine the abundant statistics and note the force of their unsifted and therefore highly conservative verdict, we are led to feel that the estimate is by no means unreasonable, and that it may be applied with equal justice to practically every civilized nation.

Thus the famous investigation of the Massachusetts Bureau of Labor Statistics revealed the fact that 84 per cent. of all the criminals under

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conviction in the correctional institutions of that State owed "the condition which induced the crime" to intemperate habits. The investigation included the inmates of such minor correctional institutions as jails and workhouses, a very large proportion of whom were there for being "drunk and disorderly"; but if these were excluded, and attention confined to charges other than drunkenness, alcohol could still be made responsible for 50.88 per cent., or more than half, of all crimes. An almost identical result was reached quite independently by the investigators of the Committee of Fifty, who very carefully scrutinized the records of 13,402 convicts in seventeen prisons and reformatories scattered through twelve States. The investigation did not include ordinary jails, and therefore took no account of "persons convicted for mere misdemeanors, drunkenness, or violation of the liquor laws." The investigation was conducted with great care, "in many instances by the chaplains, in others by the superintendents of the prisons and reformatories in question."

The results showed such discrepancies as must be expected where comparatively small numbers of cases are investigated by different observers, the cases in which intemperance was a recognized cause of crime varying from 26.16 per cent. in one institution to 72.47 per cent. in another. The average, however, was 49.95 per cent., a percentage which the Committee of Fifty puts forward

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with much confidence as representing, they believe, "an approximate expression of the truth." It is very justly argued that the agreement between these figures and those of the Massachusetts Bureau (as just cited) "is too striking to need further comment."

It is of interest to note that the institution whose inmates showed the lowest percentage of intemperance in the above-cited investigation of the Committee of Fifty was Sing Sing Prison. At first glance this seems surprising, since this prison is recruited so largely from New York City. The explanation is found in the fact that only first-term men are sent to Sing Sing, which therefore "gets an unusual class of prisoners; in fact, a great many are from the higher walks of life, men in business and the professions, as well as trusted employees, etc." It is a matter of course that intemperance should figure as a relatively infrequent cause of crime among this class of prisoners; yet even here, as we have just noted, one man in four owes his fall to alcohol. Moreover, it is reported that "of 233 cases of convicts in the Sing Sing and Auburn prisons, Mr. Dugdale found that of those who had committed crimes against the person 40.47 per cent. were habitual drunkards, while of those convicted of crimes against property 38.74 per cent. were habitual drunkards. Of the former about 38 per cent. and of the latter about 43 per cent. came from intemperate fam-

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ilies. Among 176 habitual criminals, 45.45 per cent. came from intemperate families and 42.61 per cent. were habitual drunkards."

Results in Europe Parallel Those in America

THESE highly suggestive figures are closely paralleled by the statistics of European nations. Thus Dr. William C. Sullivan, medical officer in his Majesty's service, says: "Personal investigation directed to this matter in the English prisons indicated that about 60 per cent. of graver homicidal offenses and about 82 per cent. of minor crimes of violence could be attributed mainly to the influence of alcoholism. In the graver cases this influence was almost always due to chronic intoxication, except in some instances where an initial abnormality of mind had created a special susceptibility to the action of alcohol. In the less serious cases, on the other hand, as many as 15 per cent. of the criminals acted under the influence of merely casual drunkenness. This difference between the two series of cases is doubtless to be accounted for on the theory that in some proportion of the trivial cases external influences played a relatively larger part, whereas the graver crimes were always the expression of a primary homicidal impulse such as chronic alcoholism can, but simply drunkenness cannot, engender. This

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view is supported by the fact that suicidal impulses are much more often found in association with the graver homicidal acts."

"As far back as 1834," says Dr. T. N. Kely-nack, editor of the *British Journal of Inebriety*, "a select committee of the House of Commons declared that to the traffic in intoxicants was due 'the spread of crime in every shape and form.' Later testimony (including that of numerous select committees and royal commissions) has affirmed the same contention. The Rev. Canon J. W. Horsley, formerly chaplain to H. M. Prison at Clerkenwell, estimates that 75 per cent. of crime as he has seen it in prison work may be 'directly or indirectly attributed to intemperance,' and so experienced an observer as Mr. Thomas Holmes indorses the statement that '75 per cent. of crime is in some way connected with drink.' " In Scotland, according to a report of the president of the Prison Commission, 90 per cent. of the inmates of correctional institutions are directly or indirectly the victims of alcohol. Of 53,000 persons arrested for minor offenses in the year 1896, almost three fourths were under the influence of liquor when taken into custody. In Ireland it is similarly estimated (according to Baer and Laquer) that from 75 to 90 per cent. of offenses against the law owe their origin to the use of alcohol.

In France the association between alcohol and crime has long been officially recognized. The

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direct causative relation between one and the other was pointed out before the Anti-Alcohol Congress in 1889 by the director of the Bureau of Statistics of the French Ministry of Justice. He showed that the consumption of alcohol per capita in France had increased in a single decade from 2.72 liters to 3.83 liters, and that the number of apprehended criminals had increased during the same period from 172,000 to 185,000—with no corresponding increase of population.

Enrico Ferri attempted to make the association between intoxication and crimes against the person clear by showing that, during the period 1850–80, such crimes (including murder) increased and decreased in France from year to year in direct correspondence with the fluctuation of the grape crop. A large vintage was followed, according to his investigations, by an increase of crime; a small vintage by a distinct decrease; and the more extreme the oscillation in wine-production the closer and clearer seemed the correspondence. The validity of this inference has not gone unchallenged, and indeed the conditions involved are so complex that such a presentation of facts must lack something of demonstration; but it cannot be questioned that the facts themselves are highly suggestive; and the definite correspondence between the increased use of alcohol and moral decay (with its attendant increase of crime) is so closely recognized in France that strenuous efforts are

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being made to check the evil. So effective have these measures proved that the consumption of alcohol, which had increased fivefold in France in the sixty years preceding 1898, was decreased by one third in the ensuing half-decade.

A similar correspondence between increased consumption of alcohol and augmentation of crime has been observed in Belgium and in Italy. The same relation has been illustrated conversely in the more gratifying experience of Norway, where in five years the consumption of alcohol per capita was reported to have fallen from five to four liters, with an attendant decrease in the number of criminals in the proportion of 207 to 180 for 100,000 of the population.

Results of a Convivial Sabbath

ILLUSTRATIONS of another type directly linking alcohol with the commission of crimes of violence have been presented by various German investigators. In Germany, as is well known, Sunday is the universal recreation day, and the average working man, in particular, has time and opportunity to drink several times his usual daily quantity of beer. The time of indulgence begins Saturday, and the effects of over-indulgence are still in evidence on the following Monday. It

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would seem, then, that if alcohol is directly responsible for the impulse to the commission of crimes, a disproportionate number of crimes would be committed in the forty-eight hours in question, as contrasted with the remaining days of the week. That such is in reality the case is the testimony of many careful investigators. Pastor Schroter examined the records of 23,329 convicts in 61 German prisons with reference to this point. He found that 32.4 per cent. of the crimes against the person, including homicides, 35 per cent. of the cases of disturbance of the peace, 17.5 per cent. of the cases of arson, and 20 per cent. of the robberies were committed on Sunday.

Sunday was thus proved to be responsible for more than one fourth of all these crimes, instead of for its normal one seventh. The period comprising Saturday night, Sunday, and Monday was chargeable with 58.4 per cent. of the assaults and murders, with 82 per cent. of the breaches of the peace, and with a full half of all the crimes under consideration.

Similarly, Pastor von Koblinksi found that in Düsseldorf 43 per cent. of all crimes and 59 per cent. of crimes against the person were committed on Sundays; Saturdays being responsible for an additional 16.3 per cent., Mondays for 18 per cent., and the remaining week-days for only 4 to 7 per cent. Aschaffenburg, with the aid of Fertig and Kürz, studied this question as affecting the

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convicts in prison at Munich, at Worms, and at Heidelberg. Here the records show: 14.2 per cent. of crimes committed on Saturdays, 35.8 per cent. on Sundays, 17.3 per cent. on Mondays, and 6.6 to 9.6 per cent. on the remaining days of the week.

In Dresden, Örtel charges Saturdays with 15.2 per cent. of crimes, Sundays with 28 per cent., and Mondays with 17.9 per cent. Löffler found that (in the year 1903) 33.08 per cent. of the crimes were committed on Sundays, and 19.23 per cent. on Mondays. An official diagram for the German Empire for the year 1898-99 shows graphically (according to Baer and Laquer) the proportion of crimes against the person to be charged against each day of the week. They rank thus: Sundays 254 crimes, Mondays 125, Saturdays 103; remaining days in a descending scale with Friday, credited with 48 crimes only, at its foot.

Thus it appears that the coming of "pay-day" induces conditions that more than double the propensity to commit crime; and that the "day of rest" brings with it conditions that increase that propensity more than fivefold. Little wonder that the succeeding day is known so generally as "blue Monday."

I have cited these statistics at some length because I wished to make clear some striking results of a convivial holiday among a people whose national beverage is a very mild beer (containing only about 3 to 5 per cent. of alcohol) and who

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enjoy a well-earned reputation for relative sobriety.

Crime in Countries of "Light" Drinks

FURTHER to emphasize the dangers of even the mildest of alcoholic beverages, I may cite, very briefly, some prison statistics to show that the relation of alcohol to crime is much the same in beer-drinking Germany and Austria and in wine-drinking France that we have seen it to be in America and in England.

Thus Baer investigated the histories of 32,837 prisoners confined in 120 jails and prisons of the German Empire. Of these 41.7 per cent. were either occasional or habitual drunkards. Only 18.1 per cent. of the women prisoners were drunkards, but among these the proportion of chronic inebriates was higher than among the men. Of male convicts alone, 43.9 per cent. were alcoholics, and for certain types of crimes the proportion ran much higher. For example, 46.1 per cent. of the murders, 63.2 per cent. of homicides, 74.4 per cent. of the cases of homicidal assault, 62 per cent. of assault cases of a milder type, and from 54.2 to 77 per cent. of various classes of offenses against the public peace were associated with inebriety.

In Vienna Löffler's analysis of 1159 convicts revealed 58.8 per cent. as alcoholics; of the cases of homicidal assault and of various types of

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breaches of the peace from 54.1 to 77 per cent. were traceable to the influence of intoxicants. At the Prison of St. Pélagie in Paris, Marambat has compiled statistics covering a long term of years. His report, given before the International Congress at Budapest in 1905, shows that in the year 1885 among 2950 prisoners 72 per cent. were alcoholics; in 1899 there were 2372 prisoners, 66.4 per cent. of whom were alcoholics; in 1905 the prisoners were 1106, with 68.6 per cent. of alcoholics. Of the murders, homicidal assaults, and assaults with bodily injury 83.6 per cent. were chargeable to the influence of alcohol among the most recent group of prisoners; in 1898 the proportion was 88.2 per cent. Three fourths of the entire number of convicts, in 1898, were recidivates, and of these 78.5 per cent. were drunkards.

Whosoever is disposed to argue for beer and wine as harmless national beverages may advantageously consider with care the implications of the prison statistics just given. If it be said that many of the criminals in question were doubtless consumers of brandy or absinthe as well as beer or wine, the contention may readily be admitted; but it is equally little in doubt that very few of the delinquents would ever have developed a taste for these stronger liquors had not the milder ones prepared the way.

Considering the final results in their larger relations, there seems not much to choose between the

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beer of Germany, the wine of France, the ale of England, the whisky of Scotland, and the mixed drinks of America. The seductive alcoholic content of each beverage is the real attraction. That this alcoholic agent, whatever the particular medium of its ingestion, is all-potent in producing conditions that lead to crime, is a fact so evident that any one who can deny it after reviewing the evidence must be "either blind or an idiot," as Dr. Gennat, director of the Hamburg prison, tersely if somewhat brusquely declares.

The precise share of alcohol among other recognized causes of crime is a matter more open to debate. Yet, as has been seen, considering the complexities of the subject, there is singular uniformity of opinion as to this among the expert students of criminology of many countries. Dr. Gennat gives it as the result of his own personal observations in Hamburg that "at least 50 per cent. of crimes of violence and 75 per cent. of offenses against public peace and morals must be ascribed to the excessive use of alcohol; and that 80 to 90 per cent. of cases of habitual vagabondage as well as of prostitution are associated with alcohol in the rôle either of cause or effect." Such estimates are of course but general approximations; yet this one might serve as a fair enough summary of a wide range of detailed statistics.

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Alcohol and Pauperism

It appears, then, that alcohol must be held responsible for about four fifths of the anti-social propensities that make necessary the huge paraphernalia of police systems, criminal courts, jails, prisons, and reformatories that constitute so serious a blot upon present-day civilization. Were it not for the influence of alcohol, a vast army of delinquents, who prey upon society directly when at large and indirectly through cost of sustenance when confined in correctional institutions, might be living useful, productive lives, as normal members of a normal society. Let us inquire to what extent the same thing may be true of that even more numerous body of unfortunates whose inadequate equipment for the battle of life brings them within the ken of charitable rather than of correctional organizations and institutions. In other words, let us seek to reduce to somewhat precise terms the relations existing between alcohol and the state of acknowledged dependency called pauperism.

The problem is an exceedingly complex and difficult one—quite impossible, indeed, of really accurate solution in the present state of sociological science. Nevertheless a considerable number of zealous and unemotional efforts have been made to secure accurate and scientific data among certain

classes of dependents or in localized regions, and a comparison of these will give a convincing answer having at least such a degree of definiteness as our present purpose demands.

Perhaps the most painstaking and comprehensive investigations in this line conducted in this country are those made quite independently by the Massachusetts Bureau of Labor Statistics and by the famous Committee of Fifty. The one took cognizance of conditions in Massachusetts only; the other secured returns from a large number of charitable organizations in various States. A comparison of the results of the two investigations is given in the report of the Committee of Fifty in the following words: "The results [of the Massachusetts investigation] show that in Massachusetts about 39 per cent. of the paupers in almshouses had been brought to their condition by the personal use of liquor, and that about 10 per cent. had come there through the intemperate habits of parents, guardians, or others. Our figures, based upon almshouses throughout the country, give an aggregate of a little less than 33 per cent. of cases due to the personal use of liquor, and about 8.7 per cent. due to the intemperate habits of others. While our figures are slightly below those of Massachusetts, they are much nearer to them than any other set of figures quoted, and this fact is an important evidence of their general accuracy."

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It appears, then, that about two fifths of the paupers cared for in the almshouses of this country demonstrably owe their condition to alcohol. Of that vastly larger company of dependents that are given outdoor or indoor relief by the almost numberless charity organization societies, it was found that fully 25 per cent. were impoverished through the direct or indirect influence of liquor.

Statistical Anomalies

THE gathering of statistics as to this class of dependents presents obvious and peculiar difficulties, particularly in large cities, where, by a curious paradox, the life history of every individual is so much more shielded from public scrutiny than in smaller communities. Notwithstanding all assurances to the contrary, a belief will lurk in the minds of most applicants that the admission of intemperate habits will conduce to their disadvantage; therefore outside evidence must be depended upon, and this, as just noted, is peculiarly difficult to secure in large cities. This fact probably accounts, in part at least, for the wide discrepancies as to the matter in hand between the reports of the various relief committees upon which the estimates of the Committee of Fifty are based. The average is kept down by the figures from New York City, Chicago, Brooklyn, and Baltimore, for example, which show from 21 to

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23.11 per cent. of intemperance as a cause of poverty; whereas such small communities as Worcester, Mass., Louisville, Ky., Bayonne, N. J., and Pawtucket, R. I., give figures showing from 43.90 to 57.61 per cent. of intemperance.

It is hardly supposable that intemperance is actually more rife proportionately in the smaller than in the larger communities (that it is, for example, twice as prevalent in Cambridge, Mass., as in New York City), but, on the other hand, of course there may be conditions that make its effects in producing poverty more marked in one community than in another. But any argument along these lines, after all, does no more than emphasize the truth already mentioned, that statistics as to the evil effects of alcohol are, in the nature of the case, understatements of the truth. Not to seem to lean toward special pleading, however, we may accept the estimate of the Committee of Fifty as the most authoritative presentation of the facts as yet available. Stated precisely, their conclusion is this: "The general average percentage of poverty due directly or indirectly to drink is 25.06 per cent., with 6.03 per cent. of the total number of cases unaccounted for."

An inkling of what this means when reduced to tangible figures may be gained from the reflection that New York City alone ministered officially, through the agency of its charitable institutions, to about 375,000 applicants in the year 1908.

The Destitute and Deserted Children

YET another class of dependents came within the scope of the investigations of the Committee of Fifty, namely, that most pitiable of all groups of human derelicts, the destitute and neglected children. "It is estimated that in this country about 16,000 children annually are deserted by their parents." But this group, after all, is small compared with the vast army of children whose parents, though not actually deserting them, are unable or unwilling to give them adequate attention. Many of these are never brought within the ken of the statistician; others receive attention from the societies for the prevention of cruelty to children, and from such organizations as the National Children's Home Society. From the records of these institutions the statistics of the Committee of Fifty were compiled.

The result is startling, even if not unexpected. It is revealed that "nearly 45 per cent. of the children harbored owed their destitution to the intemperance of parents, while nearly 46 per cent. owed their destitution to the intemperance of parents and others (guardians, etc.) together. The worst phase of poverty occasioned by drink is thus seen to be in the fact, not that the drinker himself suffers, but that innocent persons suffer still more."

Alcohol and Pauperism in Europe

It is fairly demonstrable, then, that, as a minimal estimate, about two fifths of the paupers in almshouses, one fourth of the seekers of charity outside almshouses, and almost one half of the dependent children in America owe their deplorable condition to alcohol. Few European countries afford dependable statistics for strict comparison with these; but the general relation between alcohol and pauperism is everywhere recognized, and in numerous localities studies have been made with the aim of determining the exact share of alcohol in producing the gigantic burden of incompetency with which every civilized society is handicapped.

What is declared to be "much the most accurate investigation on record" in England was made by Alderman Alexander McDougall in the township of Manchester in 1883. The number of cases involved was relatively small, but the investigator himself interviewed each individual, and competent authority regards his results as absolutely conclusive for those particular cases, and therefore as typical of a large class. Pauperism was found to be brought about by causes directly arising from drinking habits in more than half (51.34 per cent.) of the entire number of cases, which include "persons in receipt of in-

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door relief drawn from all classes, persons in receipt of outdoor relief, inmates of the female lock wards, and [a small number of] vagrants." Of the entire number of paupers, 24.32 per cent. were intemperate men, 4.40 per cent. intemperate women. The widows and children of drunkards made up 21.84 per cent. of the total, and .68 per cent. were the widowed mothers of drunkard sons, "who could support them if steady." It is interesting to note that among the intemperate men there were four skilled workmen to every three unskilled.

Collating the available statistics for England, Dr. Ralph H. Crowley, of the Bradford Royal Infirmary, reaches the conclusion that, "were a careful inquiry to be instituted into the causes of pauperism throughout the country, it seems almost certain that drink would claim a proportion of one third to one half." "When we remember," adds Dr. Crowley, "that the total cost of poor relief is in round figures twelve million pounds sterling[\$60,000,000]per annum for England and Wales, we realize what an enormous sum the taxpayer has to find under this heading due directly to drunkenness."

Continental statistics as to the relation of intemperance to pauperism are less abundant than might be desired, largely, perhaps, because it is only in recent years that the temperance movement has gained a popular hearing in most com-

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munities. The oft-cited investigation of the German Imperial Statistical Bureau, conducted in 1885, is admitted to afford no reliable information as to this point, and various official reports as to local conditions are so at variance with universal experience—so contradictory of common knowledge—as not to be taken seriously in Germany or elsewhere. In Charlottenburg in 1898–99, for example, among 4189 paupers only three individual cases were ascribed to alcoholism. Yet Charlottenburg is a suburb of Berlin, and in the great Charité hospital of that city Dr. Siemerling reports from 43.3 to 51.9 per cent. of alcoholics among all the patients admitted in two successive years.

Referring to the Charlottenburg statistics, Dr. George Keferstein, of Lüneburg, points, by way of contrast, to the statistics of sixty years' standing of the city of Osnabrück, where 56 per cent. of all paupers were declared to owe their condition to drink. He cites also the reports of the German labor colonies showing that of 44,539 men admitted in the period 1882–91, no fewer than 77 per cent. owed their condition directly or indirectly to alcohol; and he quotes with approval the declaration of Grumbrecht (a member of the German Parliament) to the effect that whoever has watched attentively for a term of years the work of applied charity in a fairly large city cannot escape the conviction that nine cases of pauperism

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in every ten must associate their condition with the use and abuse of intoxicants. "This observation," adds Dr. Keferstein, "is confirmed by the experience of the city of Geneva, where 90 per cent. of the cases in receipt of charity are reported to owe their condition to intemperance."

Of similar import are the declarations of Alderman Emil Münsterberg, of Berlin, that 50,000 cases owing their infirmity to drink are yearly cared for in the hospitals of Germany; and that of about 3000 families left in need in Berlin alone through desertion, "in scarcely a single case is the severance of family ties due to any other cause than drunkenness and debauchery." Alderman Putter, of Halle, reports that in that city of about 120,000 inhabitants in the year 1902, the families of 175 drunkards received official aid, and 75 drunkards were confined in institutions, the total cost to the city being 215,000 marks. Putter estimates that one third of all the recognized poverty in German cities may be ascribed to alcoholism. Drs. Baer and Laquer accept this estimate as "not too high," and deduce the inference that the annual official expenditure of the German Empire in aid of pauperism due to alcohol is not less than fifty million marks.

A widely quoted estimate published in a periodical devoted to the charities of Hamburg ascribes 50 per cent. of the pauperism of that city (in the year 1902) to intemperance; and Picard,

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making universal application of a similar estimate, declares that misery and need follow intemperance like a shadow, and that the day which witnesses the abolition of drunkenness will witness also the disappearance of more than half the pauperism with which mankind is now afflicted.

By Way of Summary

It will be observed that these estimates, ascribing from one third to one half of the recognized poverty of the Fatherland to the effects of alcohol, are singularly in harmony with the estimates made for England by British investigators, and with the careful statistics compiled for America by the Committee of Fifty. Such correspondences cannot well be accidental. They give secure warrant for the belief that at least one third of all the recognized pauperism in the most highly civilized communities of Christendom results from bodily and mental inefficiency due to alcoholic indulgence.

A similar correspondence of testimony shows, as we have seen, that the same cause is responsible for the mental overthrow of fully one fourth of all the unfortunates who are sent to asylums for the insane; for the misfortunes of two fifths of neglected or abandoned children; and for the moral

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delinquencies of at least half of the convicts in our prisons and of not less than four fifths of the inmates of our jails and workhouses.

We have previously seen how alcohol adds to the death-roll through alliance with all manner of physical maladies. Did space permit, it might be shown how largely the same common enemy is responsible for suicides and sudden deaths by accident in many lands, for the universal prevalence of venereal diseases with all that they imply, and for a large proportion of such cases of marital infelicity as find record in the divorce courts. But these, after all, are only minor details within the larger scheme of human suffering already outlined. The insane, the criminals of various types, and the recipients of charity make up the great mass of abnormal members of the body politic whose unfitness receives official recognition.

Let it be particularly borne in mind that the conclusions just presented as to the causal relation of alcohol to the production of each of these abnormal elements of society are as far removed as possible from sentimental estimates or pessimistic guesses. They are inductions based on careful surveys of evidence. Dealing with matters of great complexity, they are subject to a good deal of latitude, for reasons that I have given; but they are sufficiently precise to serve the purpose of reasonably secure scientific hypotheses. Considered as gages of the misery caused by al-

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cohol, our percentages are utterly inadequate, to be sure. There is a vast host of victims of alcohol that cannot thus be classified, as a moment's consideration will show.

For every individual that dies prematurely of a disease directly due to alcohol, there are scores of individuals that suffer to a lesser degree from maladies which are wholly or in part of the same origin, but which are not directly fatal.

For every patient that suffers complete mental collapse as the result of alcoholism, there are scores of patients that are the victims of epilepsies, neurasthenias, neuralgias, choreas, and palsies of alcoholic origin.

For every criminal that alcohol sends to prison, there are scores of persons whose moral delinquencies, induced or emphasized by alcohol, are not of the indictable order, yet are a source of suffering to their friends and a detriment to humanity.

For every incapable who, weakened by alcohol, acknowledges defeat in the life battle and openly seeks alms, there are scores of individuals that feel the pressure of want in greater or less degree because the money that might have supplied necessities and luxuries has gone for drink, yet who strive to hide their indigence.

For every marital partner whose infelicities of life, due to alcohol, come to the cognizance of the courts, there are scores of individuals—women in

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particular—that suffer in silence and screen their affliction behind a veil of pride.

For every neglected or abandoned child that comes to the doors of orphanage or misnamed “home,” there are scores of children whose present lives are saddened and whose future prospects are marred by the upbringing in homes that alcohol rules without absolutely disrupting.

But the members of all these vast companies of sufferers lie without the present ken of the statistician. They have no share in the estimates that have just been presented. Only those unfortunates noted officially in death certificates or in the records of asylums, prisons, almshouses, and charitable organizations are recognized in our statistics. Even though the scope of the inquiry be thus restricted, however, the victims of alcohol brought to view constitute a motley multitude of appalling dimensions and of pitiful characteristics. Physical degenerates, mental wrecks, moral perverts, social outcasts—like the inchoate rabble of a routed army—they mass into companies, that grow to regiments and legions before the mind’s eye—tens of thousands, hundreds of thousands, millions in the aggregate—and march hopelessly beneath the yoke of the greatest of conquerors, King Alcohol.

For the great majority of this vast company the way along which they journey is a road that has no turning, nor any goal more hopeful than a

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soul-Siberia in which existence may without sentimentality be described as a living death.

No other agency in modern civilization—not war nor famine nor pestilence—can claim so appalling an array of victims.

As we view this joyless pageant, the vast majority of its members impelled by a power they loathe yet must obey, a realizing sense comes to us of the tyranny exercised over humanity generation after generation by this arch enemy of progress. In the light of such a sequel there is ironical humor in the reflection that the medieval alchemist who introduced alcohol to the Western world believed that he had discovered the long-sought elixir that would make man immortal, and thus was led in all seriousness to give to this most implacable of destroyers the grimly paradoxical name of *Aqua Vitæ*—the Water of *Life*!

CHAPTER III

ALCOHOL AND THE RACE

IT is hoped that the evidence presented in the foregoing pages as to the effect of alcohol upon the individual organism and upon the community is at once clear and convincing. Ample testimony from the fields of experimental science has been forthcoming to show the highly deleterious influence that even moderate drinking may exercise over all the vital organs of the body. Abundant statistics of asylums, prisons, and eleemosynary institutions have been presented to suggest how largely alcohol interferes with the orderly progress of the social organism. It is impossible to consider thoughtfully the array of facts thus put in evidence without extending the view from the individual and the community to the race of which they form a part. Involuntarily the query arises:

If alcohol affects individual and community thus harmfully, must it not, as a natural consequence, exert a most deleterious influence upon the evolution of the race?

It does not comport with my present purpose

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to answer this question here except in the most summary way. It is axiomatic to say that an agent that harms individuals must harm the body politic which their aggregate numbers compose, unless there be some compensating factor more than balancing the evil. So far as I am aware, only one such possible compensating factor has ever been suggested, in defense of alcohol, that need be seriously considered. This is presented in the theory that alcohol tends generation after generation to kill off the more susceptible and weakly portion of the community prematurely, thus becoming a factor in natural selection through the survival of the fittest.

The fatal objection to this theory is found in the fact that alcohol does not, for the most part, render its victims incapable of propagating the species. Most diseases engendered by alcohol are of slow chronic progress, even though fatal in the end; and the subject of the disease is, for a long time at any rate, not debarred from producing offspring; he is only menaced with the extreme probability that the offspring will not be normal. The effect of alcohol upon the progress of the race, considered from the standpoint of heredity and evolution, would thus appear to be exactly the reverse of what the suggested theory proposes.

Even were the fact otherwise, however, the argument for alcohol as a means of eliminating the weakly and undesirable elements of society would

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ill accord with the modern conception of public polity. For precisely the same argument might with equal logic be applied in favor, for example, of contagious diseases. Only the weaker tenth of humanity, it might be said, succumb to tuberculosis; ergo, tuberculosis is an excellent agency for the strengthening of the race.

Alcohol and the State

It being thus made obvious whither such a line of argument leads us, we may be content to dismiss the paradoxical view that an agent known to be destructive to individual health and happiness is likely to be advantageous to the race. In its place stands the equally obvious common-sense induction that alcohol exerts a powerful retarding influence over the progress of humanity; that it is, therefore, an agency which, according to all modern conceptions of public policy, should fall within the cognizance of the State.

This common-sense view of the matter is one that all modern governments have acted upon in practice. Everywhere the liquor traffic is subject to governmental control, and the legitimacy of laws that put restrictions upon the traffic in alcohol has been sustained by the highest courts. The opponents of such laws have had much to say about the infringement of personal liberties; but

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such argument may be dismissed very briefly by any one who has a clear idea of the principles underlying the legislative policy upon which modern civilization is conditioned. Governmental restrictions of any kind imply certain concessions made by some individuals in the interest of the many. What we commonly speak of as our "rights" are found, on closer analysis, to be only privileges that are accorded us because they do not involve activities that are detrimental to the community as a whole. The moment our individual desires lead us to activities that are detrimental to the community, the laws—made and approved by the majority—step in to curtail our "rights," and no one not an anarchist questions the propriety of such curtailment. We may not, for example, help ourselves to our neighbor's belongings, however much we may desire or need them, without making ourselves liable to have our most sacred "rights" of liberty and freedom utterly abrogated. Nor may we give or sell to our neighbor things confessedly likely to injure him—such as recognized poisons—without similarly overstepping the bounds imposed upon personal liberty of action in accordance with the ideas developed by the complex mechanism of modern society.

It would be absurd to claim, then, that State control of the liquor traffic involves any principle of governmental action that is in any way new or

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unusual or oppressive—provided always that it be admitted that the liquor traffic may be so conducted as to be or become a menace to the best interests of the community. That alcohol is, in point of fact, such a menace I have attempted to show, by the calm presentation of scientific evidence, in the preceding chapters of this book. If the evidence therein presented be accepted as conclusive, no further argument is needed as to the propriety of controlling the liquor traffic by legislative means. The only debatable question is as to what particular lines of social and legislative activity are most likely to prove effective in controlling an acknowledged evil.

This question I shall not here discuss. What I do wish to point out, however, is that effective legislation must always follow rather than lead public opinion. Laws are effective only when a controlling majority of citizens recognize their validity and desirability. So, in this particular case, temperance laws will be effective only as applied to communities where there is a predominant sentiment in favor of temperance.

It follows that the educator must prepare the way for the legislator in solving the liquor problem. And to this end the educator must himself become fully informed on the subject. Unfortunately, it has not hitherto been easy for even intelligent and well-read persons to gain as clear knowledge in the premises as could be desired.

My object has been, in the foregoing pages, to supply the fundamental data in a form readily assimilable. I wish now to add a few suggestions of a somewhat more general character.

I would suggest, for example, that many intelligent persons, even among the friends of temperance, fail to appreciate the real import of the subject, through lack of knowledge of the social and economic interests involved. A few words as to these may therefore be of service.

The Magnitude of the Problem

THE magnitude of the liquor traffic, as a mere commercial enterprise, is suggested by the bald statistics of production of the various alcoholic beverages. In glancing at the statistics we shall be led to realize how enormously the problem is complicated by the gigantic financial interests encountered on every hand. We must reflect also that political interests of a very fundamental character afford additional complications. Merely as a problem in economics the subject is thus enormously complex, even if it were not hedged about everywhere by prejudice and preconception.

As long ago as 1891 the consumption of intoxicating liquors in the United States rose to the thousand-million-gallon mark. In 1896, the year covered by an impartial report of the United

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States Bureau of Statistics, the amount consumed was 1,170,000,000 gallons. At that time, according to the official report, the total capital invested in the liquor interests in this country was \$957,000,000, of which 59 per cent. was represented in retail trade exclusively devoted to alcoholics, and an additional 15 per cent. in retail trade combined with other business.

The total government revenue from alcoholic liquors for the year 1896 was more than \$183,000,000.

There were 191,519 proprietors of establishments interested in different forms of the liquor traffic, and their employees numbered 241,755 persons. Some of these were not exclusively occupied in dealing with alcoholics; but an estimate was made of the number of persons that would be required for the traffic if so occupied. The grand aggregate was 364,000 persons. If each of these were supposed to maintain an average family of four, it follows that 1,800,000 persons received their exclusive support from the liquor traffic. And this took no account of the individuals engaged in producing the materials from which alcoholic liquors are made, nor of those engaged in the transportation of these materials and of the finished products. If these were added, the grand total of persons supported by the liquor traffic in the United States in the year 1896 would doubtless include more than 2,000,000 individuals.

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Since the time when these statistics were compiled, the liquor traffic has increased at an astounding rate. In the year 1900, according to the census report, the total consumption of liquor was in excess of 1,322,000,000 gallons. Three years later it passed the 1,600,000,000 mark. In 1906 it rose to more than 1,800,000,000 gallons. In 1907 it reached the stupendous figure of 2,000,000,000 gallons, having thus doubled in sixteen years.

In 1900 the capital invested in liquor-manufacturing establishments (representing only about one fourth of the total investment) was more than \$457,000,000. The cost of materials used in these manufactories (farm products, etc.) was over \$70,000,000, and the wholesale value of the product was over \$340,000,000.

Startling as these figures are, they are surpassed by the records of various European countries. In Great Britain the average annual consumption of alcoholic beverages in 1903 was more than thirty gallons per capita, against our twenty gallons. The annual average expenditure there for intoxicants during the first half-decade of this century was more than \$900,000,000. Germany meantime spends 3,000,000,000 marks for the same purpose—"three times the expenditure for army and navy, and seven times the cost of the public schools"; and France, with only half the population of the United States, consumes

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more than 1,400,000,000 gallons of liquor—more than thirty-five gallons each for every man, woman, and child of the population.

A Startling Deduction

SUCH figures are confusing—in a sense ineffective—from their very magnitude. A somewhat definite realization of their import must, however, be gained by any one who would hope to have intelligent comprehension of the liquor problem in its larger aspect. Perhaps the facts of the case will be a little clearer if we interpret them in the light of what we have previously seen of the effects of alcohol. Let us, for example, recall the experiments made by Dr. Schnyder and Professor Dubois with the ergograph, in which experiments 29.7 grams (less than one ounce) of alcohol proved sufficient to decrease markedly the working efficiency of the muscles, the decrease amounting on the average to 8 per cent. From these experiments we are justified in regarding one ounce of alcohol as a quantity capable of producing a distinctly deleterious effect upon an average adult.

Now if we analyze the statistics for the year 1907, we find that the twenty-five gallons of intoxicating beverages therein credited to every man, woman, and child in this country represent a sufficient quantity of absolute alcohol to supply

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each and every adult—women as well as men, with no allowance for teetotalers of either sex—with this ounce dose of alcohol on each week-day of the year, and with a slightly larger dose on every Sunday. It would suffice, in other words, to keep every adult in America permanently alcoholized to a scientifically measurable extent.¹²

Of course every one is aware that there are large numbers of individuals—some millions of them in the aggregate—who choose not to consume their share of the alcohol thus allotted, nor any portion thereof; but it follows, as a simple matter of mathematics, that the remaining millions who are not abstainers consume just so much the more. By the simple logic of unchallenged figures, then, we are forced to conclude that the millions of non-abstainers consume, on the average, a daily quantity of alcohol very markedly in excess of the quantity which rigidly conducted experiments have shown to be highly deleterious.

In other words, it is thus demonstrable that it is not merely the exceptional person, but the average drinker, who is taking alcohol in toxic quantities. And this, surely, lacks nothing of demonstrating that the alcohol problem, as presented to to-day's civilization, is a veritable race problem of appalling magnitude. It is a vital, living problem, the bearings of which impinge, directly or indirectly, upon the practical interests of every citizen, in whatever walk of life.

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Some Specious Objections

It has been suggested that the sudden withdrawal from humanity of a drug which has long been consumed in such stupendous quantities would result in physical and mental disaster to the generation. But there is no physiological warrant for solicitude on this score. The experiment of withholding alcohol from persons habituated to its excessive use is made hundreds of times every day in the case of individuals committed to our jails or to institutions for the treatment of inebriety. The individuals do not always find the experience a pleasant one at first; but in due course they usually go out into the world again, not wrecked in health but rejuvenated. If this is true of the dyspomaniac, it can hardly be argued that the more abstemious user of alcohol would be a greater sufferer.

The suggestion that the underfed portion of the community would suffer from the withdrawal of the alcohol with which they eke out their meager supply of food, is even more specious. Waiving, for the sake of argument, all consideration of the ulterior effects that render alcohol an undesirable foodstuff, it remains undeniably true that no alcoholic beverage contains any food principle that it did not derive from the grain or fruit or other vegetable product from which it was manufac-

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tured. No one pretends that the heat value of alcohol burned in the system is greater than that of the sugars from which it is derived. Meantime it is simply a commercial matter of fact that the alcohol of even the cheapest beverage is very expensive as compared with an equivalent quantity of starch or sugar supplied by an ordinary food-stuff. Considered as an "economical" food, alcohol is in a class quite by itself, its nearest competitors being, perhaps, reed-birds, woodcock, frogs' legs, and terrapin. A five-cent loaf of bread contains (unassociated with poisonous principles) several times as much oxidizable matter as a five-cent glass of beer.

Thus the most elementary knowledge of chemistry suffices to dispel the somewhat prevalent notion that beer and whisky are cheap foods, deprivation of which would work hardship, on physiological grounds, to the underfed masses of the "submerged tenth." The truth is that these masses would enter upon the road to physical regeneration could they be induced to spend their money—meager pittance though it be—for wholesome foods instead of for alcoholic beverages.

Alcohol and Adolescence

ONE other suggestion. If there is one subject more than another within the entire scope of the

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liquor problem upon which all observers are in gratifying accord, it is in regard to the dangers of allowing alcohol in any quantity to children and adolescents. During youth the habits of the body are formed, and the growing organism has peculiar susceptibility to narcotic poisons. Dr. Alexander Lambert made a study of a certain number of alcohol cases in Bellevue Hospital, with reference to the age at which the use of the drug began. Incidentally, it may be noted that the medical superintendent of Bellevue, Dr. S. T. Armstrong, reported that in the year 1906 no fewer than 6453 patients, or 35 per cent. of all admissions, were treated for alcoholism. Dr. Lambert's investigation, however, was confined to comparatively few cases, but its results typify a far wider experience. Here are the rather startling and highly suggestive facts:

“Of 259 instances where the age of beginning to drink was known, 4 began before six years of age; 13 between six and twelve years; 60 between twelve and sixteen years; 102 between sixteen and twenty-one; 71 between twenty-one and thirty; and 8 only after thirty years of age. Thus nearly 7 per cent. began before twelve years of age, or the seventh school year; 30 per cent. began before the age of sixteen, and over two thirds—i.e., 68 per cent.—began before twenty-one years of age.”

In the light of such facts, it is clear that the drink problem is essentially a problem of adoles-

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cence. The cumulative effects of alcoholic poisoning frequently fail to declare themselves fully until later in life; but the youth who does not taste liquor till his majority minimizes the danger of acquiring the habit in its most insistent form; and the man who does not drink until he is thirty is in no great danger of ever becoming a drunkard. As to the man who has passed forty—well, according to the old saw, he must be either a fool or his own physician. His habits of mind and body are formed, and if he becomes a drinker now he can at most curtail by a few years a life that is already entering upon the reminiscent stage. As factors in racial evolution, the youth of each successive generation, not its quadragenarians, are of interest and importance.

No less significant are Dr. Lambert's conclusions as to the causes (aside from inherited weakness or acquired instability) that led the patient in the beginning to enter upon the practice that was ultimately to develop an imperative appetite for alcoholics. It was concluded that "false social ideas led to drinking for the sake of sociability in 53 per cent. of the cases; a desire to dull the sense of misery in 12 per cent.; the use of alcohol as medicine in 9 per cent.; parental example or influence in 5 per cent." When finally the appetite for liquor has been fully developed, its victim drinks in response to an irresistible craving, or with the voluntary intent to render himself in-

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different or oblivious to his environment—to “drown his sorrow,” as the familiar phrase has it. But it is all-important to remember that in the beginning most youth have no such craving. In the majority of cases they begin drinking in a mere imitative way, because they see their companions and associates drinking, and because they suppose it to be a “manly” thing to follow the example of their elders. The sentiment, current among the masses, and fostered by the saloon interests, to the effect that it is an effeminate, not to say ridiculous, thing to take “soft” drinks is responsible for an incalculable amount of drunkenness.

Popular Enlightenment the Sine Qua Non

OBVIOUSLY, then, the one final object of the temperance reformer should be the education of the youth of the generation. And as a means to that end it is of course first necessary to educate the educators of youth—which includes us all. It would seem that the time has come for a great popular propaganda of the facts regarding alcohol. No one class of educators or reformers should be expected to bear the brunt of the attack against an evil of such magnitude. All the educational and reformatory forces must coöperate, each advancing along its own lines.

An obvious and tangible desideratum is the

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education of the masses, carried forward along numerous collateral lines, physical, mental, and moral, some of them aiming directly and explicitly at the drink evil, more of them only indirectly or by implication.

Many of these educative measures are already in a more or less satisfactory state of operation. Public schools, libraries and reading-rooms, working-men's clubs, the work of churches, missions, and settlements, plans for the better housing of the people, for public playgrounds, and the like—all these have their place in the great scheme of popular education which, in the last analysis, must underlie and support every rational effort to combat alcoholism. To discuss the influence of any of these important institutions and movements lies obviously beyond the scope of the present work.

Less tangible, but not less important, are the influences that may be exerted, through precept and example, by the educated classes of society in their every-day contact with one another and with the less favored classes of their fellows with whom their various vocations and avocations bring them in contact. The 500,000 professional teachers of America approach the subject from one point of view; the 125,000 clergymen from another; the 140,000 physicians from yet another; the 120,000 lawyers view the matter from a still different angle of vision. Each of these groups of culti-

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vated citizens can exert vast influences for good, if its members will work in unison. They constitute an enlightened company 900,000 strong. What a force for propagandism and education!

Again, the small army of charitable society workers have their own peculiar coign of vantage. Yet again, there is that most universal of popular educators, the periodical press, reaching out with its dailies, weeklies, and monthlies to the multitudes. Then, such organizations as life-insurance societies can aid materially by giving wide currency to their statistics showing how abstinence promotes longevity. Labor unions can exert an influence of unique and far-reaching character. And there is scarcely a normal individual in any walk of life who has not opportunity to add his mite.

Thanks to the scientific investigations of recent years, the main facts regarding the baleful influence of alcohol are no longer matters of dispute. Let us then unite to disseminate knowledge as to the essentials, and not waste time and energy quibbling over non-essentials. Transcendental hair-splitting as to whether a drug oxidizable in small quantities in the body is or is not therefore a "food"; as to whether a drug not immediately and demonstrably toxic in minute quantities is or is not to be labeled "poison"; as to whether a drug the final effect of which is narcotic may not still be classed as a "stimulant" because of pre-

liminary effects—such questions properly concern the physiologist and the dictionary-maker alone. They have no practical significance from the standpoint of any one but the physician. It is a reproach to science that men confessedly agreed as to all material aspects of the subject should confound the issues and give joy to the hearts of the liquor-dealers by publicly quibbling over such non-essentials as these.

I would urge all true friends of temperance to avoid such pitfalls of sophistry. The promotion of temperance is a task that at best makes peculiar demands upon the temper of its votaries. We shall not greatly advance the cause by branding every one a "fanatic" who does not precisely agree with us as to methods. Let us strive to get away from our own egoistic plane of thought; to attain a level that will enable us to scrutinize evidence as evidence, unbiased by prejudice. Let us strive to overcome the propensity, which Emerson so justly ascribes to "certain men," to "neigh like a horse if contradicted." Let us strive rather to get our minds into the condition of what Huxley called "cold, clear logic engines." Then let us search for the truth, be its bearings what they may; and present it calmly and fearlessly, disseminating it as widely as we are able. The hope of temperance reform rests, in the last analysis, with a coming generation educated to a stage of wisdom that will cause the average man

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to eschew alcohol in every form as unquestioningly as the average European or American of to-day eschews opium, cocaine, and hasheesh.

It seems not unlikely that the leading race of the world a century or two from now will be the one whose members most clearly comprehend and most consistently act upon this simple principle.

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(1) ALCOHOL AND ALCOHOLIC BEVERAGES

(p. 4 of text)

PURE ethyl alcohol is a liquid each molecule of which is composed of two atoms of carbon, six atoms of hydrogen, and one atom of oxygen (C_2H_6O). The respective proportions of these ingredients, by weight, are: carbon 52.17 parts, hydrogen 13.04 parts, and oxygen 34.79 parts per hundred.

There are numerous other alcohols, all of kindred formulae, but ethyl alcohol is the essential ingredient of all intoxicating alcoholic beverages, and this is the alcohol referred to throughout our text. The proportion of this alcohol in various beverages determines their degree of intoxicating power. Most of the tests described in the text may be performed equally well with one form or another of beverage—e.g., with wine or with whisky—provided due regard is given to the respective percentages of alcohol in the various liquors in question. This, after all, only gives technical expression to the familiar fact that intoxication may result from the use of beer or of wine quite as readily as from the use of whisky, but that larger quantities are required in one case than in the other.

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It may be of interest to have at hand a table giving the proportions of alcohol in the various beverages in common use. The table compiled for the Committee of Fifty, and published in their book on "The Liquor Problem," is here appended:

	Percentage of Alcohol	
	Average	Range
French claret	8.	6—12
French white wine	10.3	9—12
German Rhine wines, Moselle, etc....	8.7	7—12
Sherry	17.5	16—20
Madeira	15.4	15—16
Champagne	10.	8—11
American champagne	8.	6—10
American red wine	9.	6—12
Sweet Catawba	12.	10—15
American lager-beer	3.8	1— 7
Vienna lager-beer	4.7	3— 5
Munich lager-beer	4.8	3— 5
English ale and porter	5.	3— 7
Hard cider	5.	4— 8
Brandy	47.	40—50
Whisky, American best	43.	41—48
Whisky, American common	35.	25—43
Whisky, Scotch, Irish	40.	36—43
Rum	60.	40—80
Gin	30.	20—40

Whatever the ingredients with which it may be associated in these various beverages, alcohol itself is always a derivation of starches or sugars. Glucose, the formula of which is $C_6H_{12}O_6$, is transformed into alcohol by a process of fermentation, through which each of its complex molecules loses two atoms of carbon and four atoms of oxygen (constituting two molecules of carbon dioxide, CO_2),

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the portion remaining constituting two molecules of alcohol (C_2H_6O).

That substances so different in all their physical properties and physiological effects as sugar and alcohol are so closely allied in composition would be matter for surprise were it not that there are countless other similar instances among the familiar substances in every-day use. Present-day science cannot explain these anomalies, but they are matter of familiar knowledge to any tyro in chemistry. Therefore no inferences of the slightest validity as to the wholesomeness of alcohol can be drawn from the similarity of its composition to that of sundry wholesome foods. Strychnine, morphine, and scores of other poisonous drugs are also compounds of carbon, hydrogen, and oxygen. Empirical observation and not *a priori* reasoning must be relied upon to determine the effects of each and all of the numberless carbon compounds when taken into the system.

(2) THE CONSUMPTION OF ALCOHOL (p. 4)

THE quantity of absolute alcohol contained in the 2,000,000,000 gallons of alcoholic beverages consumed annually in the United States is about 84,000,000 gallons, or something more than one gallon per capita.

The annual consumption per capita of intoxicants in European countries, estimated in liters of absolute alcohol (for the years 1891-95), is given by Arthur Newsholme, M.D., F.R.C.P., in the subjoined table. A liter equals about one fifth (.22) of a gallon. It will be seen, therefore, that all the peoples of Europe, except the inhabitants of Sweden, Norway, and Finland, are greater consumers of alcohol than are the people of the United States.

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ANNUAL CONSUMPTION PER CAPITA OF ABSOLUTE ALCOHOL, IN LITERS

France	15.87	United Kingdom ...	8.17
Belgium	12.58	Austria-Hungary ...	7.99
Spain	12.05	Netherlands	6.30
Denmark	10.87	Russia (approx.) ..	5.21
Switzerland	10.73	Sweden	4.43
Italy	10.30	Norway	2.66
Portugal	10.10	Finland	1.84
Germany	9.25		

(3) ALCOHOL AS A DIGESTIVE STIMULANT (p. 5)

A VERY large number of investigators have given attention to this subject, both experimentally and clinically, and many of them have been disposed to admit the wisdom of St. Paul's injunction to "take a little wine for thy stomach's sake." But the most recent experiments make the advice seem more than doubtful, from a purely physiological standpoint. At least, they make it clear that the wine had best be taken under medical supervision, if at all; since it appears that the effects of this and other alcoholic beverages on the digestive processes are by no means simple and uniform, but vary with the quantity of the beverage and with the tone of the particular digestive apparatus in question.

Among the most elaborate and significant series of investigations to test the effects of alcohol in this direction are those of Professor Chittenden, of Yale, working in association with the Committee of Fifty. His results are very definite and convincing, and they corroborate the findings of various other students, notably those of the Englishman Sir William Roberts. The gist of the

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matter is this: Alcohol, taken as proof-spirit or as brandy or whisky, directly stimulates the flow of the digestive juices, salivary, stomachic, and pancreatic. But if present in sufficient quantity to form more than 5 per cent. of the stomach contents, it materially interferes with the digestive action of the juice the formation of which it has just stimulated. Thus one of its effects tends to counteract the other; and the ultimate result will depend upon such factors as the quantity of alcohol ingested, the rapidity of its absorption, and the quality of the gastric juice itself.

Certain wines have effects that are independent of their alcoholic content. Thus claret, owing to its acidity, retards the flow of the salivary ferments; and sherry is peculiarly potent as a retarder of stomachic digestion. Both white and red light French wines also retard gastric digestion far more than corresponding quantities of alcohol. Professor Chittenden quotes Sir William Roberts with approval as declaring that, "as used dietetically, sherry must figure as having frequently an important retarding effect on peptic digestion"; and that hock and claret also are used in such quantities dietetically that "their retarding effect on peptic digestion is often brought into play." It is pointed out that half a pint of sherry would constitute a "highly inhibitory proportion" of the stomach contents; and that a pint of hock or sherry, "a common allowance with dinner for robust eaters, would not be without considerable effect."

This will doubtless come as an illuminative surprise to many a man who is accustomed to order a bottle of wine with his dinner, "to aid digestion," and who has hitherto found it unaccountable that he suffers from indigestion in spite of the supposed assistance thus secured. In fairness, however, it must be noted that, in the experience of the most careful investigators, the two antagonistic effects of alcohol on digestion pretty commonly

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neutralize each other. Professor Chittenden summarizes the matter thus: "The results collectively indicate that the period of gastric digestion is not greatly varied under the influence of alcohol or alcoholic beverages. In some few of the experiments the results indicate a slight acceleration of digestion in the presence of weak alcoholic beverages, while in others strong alcohol retards slightly the rate of digestion. Giving due heed, however, to the avoidable errors which must of necessity attend this kind of experimentation, we believe that the results obtained justify the conclusion that gastric digestion as a whole is not materially modified by the introduction of alcoholic fluids with the food. In other words, the unquestionable acceleration of gastric secretion which follows the ingestion of alcoholic beverages is, as a rule, counterbalanced by the inhibitory effect of the alcoholic fluids upon the chemical process of gastric digestion, with perhaps at times a tendency toward preponderance of inhibitory action."

Clearly this presents alcohol in a rôle quite different from that of universal stimulator of digestion in which it is so often presented. It is obviously a justifiable conclusion from the experiments, however, that an alcoholic beverage might be taken in such small quantity as to stimulate the flow of the gastric juices while not interfering with their action. Under such circumstances alcohol may indeed be spoken of as a stimulant to appetite and digestion; but this item must not be set down unreservedly on the credit side of the ledger, since the natural result would be to foster a habit of overeating, than which there is no more disastrous habit to which mankind is subject, perhaps not even excepting the alcohol habit itself.

It appears, then, that the scientific investigators have robbed alcohol of most of its traditional glory as a digestive stimulant.

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(4) ALCOHOL AS A HEART STIMULANT (p. 5)

THE evidence as to the effect of alcohol on the heart action has been admirably summarized by Dr. John J. Abel in a report published by the Committee of Fifty. We may outline the results very briefly here, chiefly in Dr. Abel's words:

"Alcohol in small and moderate quantities, that is, in such amounts as are likely to be found in the blood in any condition far short of intoxication, does not have a direct stimulating action upon the heart; indeed, these quantities show no appreciable action upon the heart itself, either in the way of stimulation or depression. . . . In very large quantities, such, for example, as result in helpless and perhaps fatal intoxication, alcohol is seen to be a direct and powerful depressant of the heart, weakening first the auricular, later the ventricular systole, causing more or less distention of both cavities, marked slowing of its movements, and great diminution of its output of blood."

It should be explained that these results refer to the direct action on the heart itself, as determined through experiments in which indirect effects, due to the action of alcohol on the mucous membrane of the stomach and on the nervous system, are left out of account. These indirect influences may complicate the results as observed in any given case, so that the pulse-beat may be either slowed or quickened after the ingestion of a quantity of alcohol. But "these indirect influences," says Dr. Abel, "must not be allowed to hide the true character of alcohol, which is always depressant in kind, and which easily gets the upper hand of the [seemingly stimulative] effects just noted. In a word, alcohol, in respect to its inherent action, when once in the blood and tissues, must be classed with the anesthetics and narcotics."

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(5) ALCOHOL AND WORK (p. 8)

PROFESSOR ROSANOFF and Dr. Rosanoff are joint authors of an interesting article published in *McClure's Magazine* for March, 1909, in which the experiments of Schnyder and Dubois are summarized somewhat in detail. I am permitted here to reproduce their account of these highly important experiments, the original report of which was contributed by Dr. Schnyder to Pflüger's *Archiv für die gesammte Physiologie*, Vol. XCIII, pp. 457-484 (1903).

"The muscle chosen for these tests was that of the index-finger of the right hand—one of the best-trained muscles of the body, and therefore little subject to accidental influences. The measuring apparatus employed was the celebrated ergograph, invented by Angelo Mosso, with improvements by Professor Dubois. In using this, the hand was fixed by holding on to a wooden peg; the arm was rendered immovable by a clamp; and a weight of several kilograms, suspended by a string passing over a pulley, was raised and lowered until complete exhaustion set in. This process was repeated twelve times with intervening rests of one minute. The length of each pull was recorded by a pencil on a strip of ruled paper. The sum of the lengths of the single lines is easily translated into 'meter-kilograms'—that is, the work done in raising one kilogram through one meter against the gravity of the earth.

"Since alcohol is a food—in the sense that it is burned in the human body and thus produces energy—Professor Dubois believed its nutritive value must play some part in its effects on the muscular system. Accordingly, he carried out five different experiments to determine its action under different conditions. The object of the first three of these was to bring out the effect of alcohol as compared with that of a food in the ordinary sense of the term.

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The Effect of Alcohol Taken Without Food

“EXPERIMENT No. 1 was a measurement of muscular efficiency four hours after meals, without either alcohol or ordinary food being administered.

“No. 2 consisted in similar measurements at the same hour of the day—between twelve and half-past twelve o'clock—but shortly after taking a certain quantity of readily digestible nitrogenous food; namely, 30 grams of tropon, a food for the sick and convalescent, containing 90 per cent. of animal and vegetable proteids.

“No. 3 consisted in similar measurements at the same hour of the day, but shortly after administering a moderate quantity of alcohol, equivalent in heat value to the amount of food given in experiment No. 2. This was in the form of 150 cubic centimeters (about two-thirds of a cupful) of good Bordeaux wine, containing 14.7 grams of alcohol, and administered fifteen minutes before the experiment.

“To obtain as reliable results as possible, and eliminate all accidental factors, each result in each class of experiment—given in the following table—was obtained by striking an average of ten single experiments taken on ten different days.

WORK DONE—METER-KILOGRAMS

Period No.	1 (nothing)	2 (food)	3 (alcohol)
1	8.089	8.656	8.473
2	3.732	3.911	4.227
3	3.102	3.447	3.288
4	3.031	3.244	3.120
5	2.904	3.115	2.992
Carried forward ...	20.858	22.373	22.100
9	129		

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WORK DONE—METER-KILOGRAMS (CONTINUED)

Period No.	1 (nothing)	2 (food)	3 (alcohol)
Brought forward ..	20.858	22.373	22.100
6	2.838	3.033	2.821
7	2.863	2.938	2.816
8	2.903	3.054	2.709
9	2.875	3.108	2.674
10	2.885	3.097	2.725
11	2.939	3.106	2.745
12	2.843	2.913	2.732
12 periods	41.004	43.622	41.322
First 5 periods	20.858	22.373	22.100
Last 7 periods	20.146	21.249	19.222

“It will be noticed that the total of the second experiment—in which the 30 grams of tropon were taken—shows an increase of 2.618 meter-kilograms over the total of the first, in which no food was taken. That is, the food increased the working capacity 6.4 per cent.

“The total of the third—in which the wine was taken—was 0.318 meter-kilograms more than the first (without food), this constituting the slight increase of 0.8 per cent. It appears, then, that while alcohol effected a much smaller increase in muscular efficiency than an equivalent amount of ordinary good food, it still produced an increase.

“But let us examine the figures more closely. The totals of the first five working periods in experiments 1 (nothing), 2 (tropon), and 3 (alcohol) are respectively: 20.858, 22.373, and 22.100. The difference between the first two is 1.515, or 7.3 per cent. of 20.858. This was the percentage of increase produced by tropon *at first*. On the other hand, the difference between experiments No. 3 and No. 1 is 1.242, or 6.0 per cent. of 20.858. This

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was the percentage increase produced by alcohol *at first*. So *at first* alcohol produced really a marked increase in muscular efficiency. We merely note, in passing, that the increase was smaller than that produced by tropon *at first*.

“Turning to the last seven working periods, we find the totals in the three experiments to be respectively: 20.146, 21.249, and 19.222. The difference between the first two experiments is 1.103, or 5.5 per cent. of 20.146. This is the percentage increase produced by tropon during the *latter stage* of the experiment. The difference between the last and first experiments is -0.924 , or *minus* 4.6 per cent. of 20.146. So during the latter stage of the experiment the effect of alcohol was a marked *decrease* in muscular efficiency. It is clear, also, that the total work done during the experiment with alcohol would have been less, and not slightly greater, than in the experiment with nothing whatever, if both experiments had been prolonged.

The Effect of Alcohol Taken with Food

“THE fourth and fifth series of experiments conducted by Dr. Schnyder and Professor Dubois were made to ascertain the effect of alcohol on an organism well supplied with nourishment, the idea being that if alcohol has some other action besides its effect as a food, a system well supplied with ordinary nourishment might refuse to profit by the superfluous nutrition offered by the alcohol, and so manifest only its other action. That other action, whatever it might be, would then become measurable by itself. The two concluding experiments were consequently these:

“Experiment No. 4 consisted of the same measurements as in the first three experiments, carried out at about the same hour of the day, but shortly after a good meal with-

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out alcohol, the meal consisting of soup, meat, vegetables, and bread.

“No. 5 consisted in similar measurements, taken shortly after meals during which a moderate quantity of alcohol was consumed. The food was the same as in experiment No. 4; in addition, 300 cubic centimeters of good Bordeaux wine, containing 29.4 grams of alcohol, was consumed in the course of the luncheon. Dr. Schnyder observes that this is about the quantity referred to as ‘a good glass of wine,’ considered by many people as a moderate, perfectly harmless, even indispensable drink. The tabulated results of experiments 4 and 5 follow, each figure—as in the first three experiments—being an average from ten different single experiments on ten separate days:

WORK DONE—METER-KILOGRAMS

Period No.	4 (food only)	5 (food and alcohol)	Loss of Efficiency
1	7.969	7.370	
2	4.418	3.872	
3	3.652	3.373	
4	3.440	3.182	
5	3.245	3.016	
6	3.215	3.136	
7	3.248	2.996	
8	3.223	3.004	
9	3.233	3.076	
10	3.254	2.929	
11	3.322	2.993	
12	3.282	2.922	
<hr/>			
Total of 12 periods....	45.501	41.869	8.0%
Total first 5 periods...	22.724	20.813	8.4%
Total last 7 periods...	22.777	21.056	7.6%

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“A peculiar fact is shown here: while alcohol is a food, the human body will not use it as such when it has ample supply of other food. Consequently, the weakening influence of alcohol, which is here got at by itself, is seen to be at work continuously. The total loss of efficiency in the twelve periods is 8 per cent. In the first five working periods it is 8.4 per cent.; in the last seven periods it is 7.6 per cent. The weakening effect, as might be expected, is really greater *at first*.”

(6) ALCOHOLIZED DOGS (p. 9)

It should be noted that the experiments of Professor Hodge with the alcoholized dogs differ from most of the experiments with which our text deals in that the quantity of alcohol used was relatively large. “The plan of the experiment,” says Professor Hodge, “was to give as large doses as possible short of producing noticeable intoxication. This dose was found for the dogs to be 4 cubic centimeters per kilogram of body weight.” That the animals were able to take such doses as this without becoming acutely intoxicated suggests that these particular dogs at least were relatively insusceptible to the effects of alcohol. I know of no experiments in which a human subject has been given anything like a proportionate dose, though there are probably some toppers who voluntarily consume an equivalent quantity.

(7) THE FOOD VALUE OF ALCOHOL (p. 10)

SAYS Professor W. O. Atwater: “The questions as to whether alcohol is a food, and whether and in what ways it supplies the body with nutriment, have been actively

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discussed for the last fifty years or more. No one doubts that the continued and excessive use of alcohol is injurious to body, mind, and character. No one questions that in large quantities it is really a poison. The debatable problem is its effects when taken in small or moderate quantities." It was this problem that Professor Atwater set about solving, with a set of experiments conducted under the auspices of the Committee of Fifty, a company of volunteer investigators of the entire liquor problem, to whose work I have had occasion to refer again and again.

Professor Atwater's investigations were conducted in the laboratory of Wesleyan University, and they were of so interesting and picturesque a character that I may briefly refer to the methods no less than the results. The chief apparatus consists of a remarkable "copper walled chamber about seven feet long, four feet wide, and six and one half feet high, in which the man who serves as subject of the experiment lives during a period of from four to twelve days and nights." Food is passed to the man through a small aperture having caps at each end. The walls of the room are made nearly impervious to heat, like those of an ice-house, and they are further kept at a uniform temperature by special apparatus. Air is kept in circulation through the chamber with the aid of a special air-pump, which measures the volume of the ventilating current, and at regular intervals draws measured samples of the outgoing air for analysis. Cold water, circulating in pipes, keeps the temperature of the room uniform, and the quantity of heat thus taken from the room is measured through observation of the changed temperature of the water itself as it comes from the pipes. Work done by the man on a stationary bicycle is transformed into heat in an electric-light bulb and carefully measured. Thus the entire output of energy due to the bodily activities (including not merely voluntary actions,

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but the more intimate processes of the bodily machine, such as digestion, the circulation of the blood, and the so-called metabolism of the tissues) can be most accurately measured.

Meantime, of course the energy supplied the body, in the form of food, is measured with equal accuracy. The chemical composition of every particle of food and the exact quantity being known, the amount of heat that would be generated by the burning of that food can be precisely estimated. No substance can properly be called a food which is not capable of being oxidized (that is to say, burned) in the body; and such oxidation results in the liberation of precisely the same quantity of heat that would be liberated if the same substance were burned in the laboratory instead of within the organism. This being understood, it will be clear how Professor Atwater's "respiratory cabinet" makes it possible to test the "fuel value"—that is to say, the real food value—of various foodstuffs.

Now for results. In those of Professor Atwater's experiments in which alcohol was included in the diet of the men in the respiratory cabinet, it was clearly shown that almost the entire quantity of alcohol given (amounting to about two and one half ounces daily) was burned in the organism, only about 2 per cent. being eliminated unchanged. This result, it should be explained, confirmed the results of the best antecedent experiments as to the fact of consumption of alcohol in the body; but it gave the first definite answer as to the proportion consumed to that eliminated. It was shown, moreover, that the alcohol did not appear to be burned in the body more rapidly than other foods of similar composition; or that if it was, it retarded the burning of other foods, so that the total energy was transformed at the accustomed rate under given conditions. Moreover, the alcohol was seen to be able to take the place of other foods, inasmuch as it

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retarded the wearing away of other tissues. It saves in this way not only the fats but the nitrogenous tissue of muscles, though of course it could not replace the latter, inasmuch as alcohol contains no nitrogen.

Stated otherwise, it appears that alcohol is a food allied in character to the sugars, with which it has close chemical affinity. If taken in small quantity, about 98 per cent. of it is burned in the body, and the resulting heat is available for the uses of the body.

Now I am aware that this finding of experimental science as to the food value of alcohol has greatly perturbed the equanimity of many friends of temperance. But I cannot in the least see why it should do so. The result is quite what might have been expected, considering the known composition of alcohol and the fact that it is itself a derivative of sugar. But to admit that alcohol may serve as food is no more equivalent to arguing for its use under ordinary conditions than the admission that human flesh may be nutritious is an argument for the practice of cannibalism. The very students who have demonstrated the food value of alcohol have been foremost to urge that their experiments must not be misinterpreted in this regard. Professor Atwater cautions the reader that his tables showing the nutritive value of alcohol as compared with other foods tell only half the truth, because they "leave out of account the action of the alcohol as a drug, which is not exerted by ordinary food. When alcohol is taken in excessive quantities," he continues, "its action as a drug may far more than counterbalance its nutritive effect. Taken habitually in excess it is ruinous to both health and character. At best it is a very expensive source of nutriment." He specifically advises "people in health, and particularly young people," to abstain altogether from alcoholic beverages. Similarly Dr. Neumann, professor of hygiene in the University of Heidelberg, and one of the foremost authorities on the subject,

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concludes a recent article on the food value of alcohol by declaring that "from the standpoint of practical hygiene we have only to wish that alcohol should be used as little as possible, because it is an irrational, a very dear, and an equally dangerous foodstuff." Develde, another Continental authority, points out that "it is more economical to feed one's self with fieldfares than with beer or wine."

Argument along this line is quite needless, however, because no one seriously pretends to take alcohol in any form merely for its food value. At the very best, no alcoholic beverage has the food value of the grain or fruit from which it is made. Alcoholic beverages owe their popularity to those other and quite different effects which have just been referred to as "drug" effects.

As bearing on the question of the ultimate food value of alcohol, the experiments of Schnyder and Dubois, showing that alcohol differs from normal foods in that it decreases the power of muscular activity instead of sustaining and increasing it, are peculiarly significant. See an earlier note of this Appendix, on "Alcohol and Work."

Dr. Frederick Peterson of New York, admirably summarized the evidence in a single sentence, when he said, in an address before the New York State Board of Charities: "If alcohol is a food it is a poisoned food."

(8) ALCOHOL AND MENTAL PROCESSES (p. 19)

THE experiments of Kraepelin and Kürz showing the marked impairment of various mental processes, and the progressive character of such impairment, from the use of repeated moderate doses of alcohol, are so very important that a good many readers may care to study their results more in detail. The account was originally published in Volume III of Kraepelin's *Psychologische Arbeiten*, in

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1900. An admirable summary of some of the more interesting experiments has been given by Professor M. A. Rosanoff and Dr. A. J. Rosanoff in the article in *McClure's Magazine* for March, 1909, from which I have previously quoted. Three sets of experiments are here described: one having to do with the power to add numbers, the second with the free associations of ideas, and the third with the capacity to memorize. The account given by Professor and Dr. Rosanoff will be found to repay careful perusal.

I. Alcohol and the Capacity to Add Numbers

"In 1900 Professor Kraepelin and his pupil Dr. Kürz¹ studied the influence of daily drinking, 'such as has been generally considered entirely harmless,' on several psychical processes, including the habitual associations of ideas involved in adding small numbers.

"We will reproduce the results of a typical experiment with two persons, A. and E., who were each given tests in adding single-place numbers for a half-hour upon each of twenty-seven consecutive days. E. was given no alcohol whatever; A. received on fourteen of the twenty-seven days a single drink, consisting of 80 grams of pure alcohol diluted with water—an amount equivalent to about three and a half tumblerfuls of claret. The drinks were taken in the evening before going to bed, while the experiments took place between nine and half-past nine in the morning. During the entire twenty-seven days both A. and E. observed the strictest regularity in their diet, walks, hours of sleep, and the general regimen of their lives.

"The following table gives the average daily number

¹ *Psychologische Arbeiten*, Vol. III, pp. 417-457 (1900).

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of single-place figures added by each man during three separate periods in the twenty-seven days, of six, eight, and thirteen days each. A. drank nothing in the evenings preceding the six days in the first period, took one drink on every evening preceding the eight days in the second period, and drank on the evening preceding the first four and the tenth and eleventh days in the last period of thirteen days. On the other evenings preceding the days in this period he did not drink.

AVERAGE DAILY NUMBERS OF ADDITIONS OF SINGLE-
PLACE FIGURES

Periods	First	Second	Third
E.—No alcohol	1,817	2,285	2,631
A.—No alcohol	1,876	2,361*	2,718*
A.—With alcohol		2,288	2,302
A.—Loss from normal.		3.1%	15.3%

“It will be seen from the first line in this table that the product of E. increased constantly in each of the three periods by reason of the daily increase through experience. E. was, in fact, introduced into the experiments merely to show what A. would have done without alcohol. For the first six days, during which he took no drink, A. performed a daily average of 1876 additions against 1817 for E., or 3.3 per cent. more than E. His normal daily averages for the next two periods are calculated on the basis of this relation to the output of E.—that is, he is assumed to be able to do 3.3 per cent. more work.

“From these figures it will be seen that during the first eight days of drinking A. lost 3.1 per cent. of his normal product. In the last thirteen days, although he

* Estimated.

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took less than half as much alcohol as on the other days, his loss was 15.3 per cent. Nothing could account for this but the cumulative effect of alcohol.

“CONCLUSION: Moderate daily drinking reduces considerably the rapidity with which habitual associations of ideas are formed in the mind. The effect of alcohol is cumulative, and increases rapidly as time goes on. The notion that alcohol ‘stimulates’ a person to his mental work is surely not corroborated by facts.

II. Moderate Drinking and Free Associations of Ideas

“IN this section we will deal with a somewhat more complex element of mental activity—the rapidity with which free associations of ideas are formed in the mind—and the influence upon it of moderate daily drinking. Measurements of the process are carried out as follows: a word, say ‘table,’ is suggested to the person experimented upon, and he is asked to write down rapidly as many other words, more or less connected, as suggest themselves to his mind, such as chair, floor, ceiling, plate, spoon, etc.

“Experiments of this kind were carried out by Professor Kraepelin and Dr. Kürz simultaneously with those discussed in the preceding section. We will reproduce the results obtained in the case of the same person, A., on the same twenty-seven days on which the habitual association experiments were carried out. The free association work was begun daily at about ten in the morning—that is, about an hour after the beginning of the experiments—and consumed ten minutes, two words being given out, and five minutes being given for writing words connected with each of these.

“The conditions affecting A. in this experiment are, of course, exactly what they were in the experiments just

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preceding. In the following table, as in the one given in that connection, there are three periods—one of six days not affected by alcohol; one of eight days, each following the drinking of alcohol; and one of thirteen days, in six of which the work was influenced by drinks of alcohol on preceding evenings.

WORDS WRITTEN IN 27 DAYS' EXPERIMENTS

Periods	6 days (no alcohol)	8 days (alcohol)	13 days (less alcohol)
Daily average	211	194	154
Losses		8.1%	27%

“The losses in this experiment, it will be seen, are calculated by taking the daily average of the first six days, in which A. drank no alcohol, as a standard. There is no second person, like E., in the preceding experiments, to furnish a basis for calculating the natural increase of A.’s work through experience, although that increase showed plainly in the first period of this experiment, when A. took no alcohol. The actual percentage losses in A.’s work are, therefore, really larger than shown here. Yet, even with this under-statement, the losses, are 8.1 per cent. and 27 per cent. in the last two periods, against corresponding losses of 3.1 per cent. and 15.3 per cent. in the preceding experiment. This would tend to indicate, generally speaking, that the more complex forms of mental activity suffer under the influence of alcohol far more heavily than the simple ones. The cumulative effect of alcohol again appears in the great increase of the loss in the second period of drinking over that of the first—although less alcohol was taken during the second period.

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“CONCLUSION: Free associations of ideas are affected by moderate daily drinking even more than the simpler habitual associations. The effect of alcohol on free associations of ideas is cumulative.

III. Moderate Drinking and the Process of Memorizing

“FROM among the results obtained by Professor Kraepelin and Dr. Kürz in their experiments on A., we will present one more set, showing the effect of alcohol on the process of memorizing. It may be recalled that the habitual association experiments occupied daily the period from nine to half-past nine in the morning and that the free association experiments commenced at about ten o'clock. The half-hour from half-past nine to ten was devoted daily to memorizing as many twelve-place numbers (for instance, 315,784,231,675) as possible. Each number was read off aloud from paper, again and again, until it could be once correctly repeated from memory; then the next number was taken up, and so forth. On the first of the twenty-seven days the memorizing experiment was omitted; so we have the results of twenty-six experiments.

“The results of the first five experiments, before A. had begun taking alcohol, as well as the results of similar experiments reported by other investigators, show that the amount memorized, too, is gradually increased under the influence of the experience-factor.

“The following considerations will help toward an appreciation of the actual results. In any increasing series of four numbers the arithmetical mean of the first and third is less than the mean of the second and fourth. We find similarly that in *any* set of twenty-six results exhibiting the normal working of an experience-factor, and free from the influence of alcohol or other drugs,

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the arithmetical mean of the first, second, third, fourth, fifth, eighteenth, nineteenth, twentieth, twenty-first, twenty-second, twenty-fifth, and twenty-sixth results *must be* less than the arithmetical mean of the remaining fourteen results. This proposition is true, no matter how variable the increase due to the experience-factor may be.

“Now, the twelve numbers just specified correspond to the twelve days on the evenings preceding which A. took no alcohol. The total number of numbers committed to memory on those days was 4671, making an average of 389 per day. Normally, without any disturbing factor coming into play, A. should have learned, according to the mathematical proposition just stated, *more* per day during the remaining fourteen days. But, as a matter of fact, he memorized on those days a total of 5107 numbers, making an average of only 365 per day.

“Alcohol thus not only annihilated the increase from the experience-factor, but produced a decided decrease of the average. Further, since the effects of alcohol are cumulative, lasting, experiments eighteen, nineteen, twenty, twenty-one, twenty-two, twenty-five, and twenty-six must have yielded abnormally low results, and the first average of 389 per day must be correspondingly low. To say, then, that alcohol produced a decrease of 24, that is, about 6.2 per cent., in the number of numbers learned per day, is in every way a gross under-estimate of the truth. It is certain that the true decrease must have been considerably greater.

“CONCLUSION: Ordinary memorizing is greatly retarded under the influence of moderate daily drinking. This conclusion is entirely corroborated by a set of twenty-seven experiments carried out by A. Smith in 1895.”

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(9) MODERATE DRINKING AND THE HANDICRAFTS (p. 21)

I AM further indebted to Professor M. A. Rosanoff and Dr. A. J. Rosanoff, and to the editors of *McClure's Magazine*, for permission to quote the detailed account of Professor Aschaffenburg's celebrated experiments given in the *McClure* article from which I have previously quoted. It will be seen that certain complications are involved in the nature of the experiments, but that the results are unequivocal.

Here is the account given by the brothers Rosanoff:

"A typesetter's work, while physical to a certain extent, involves the psychical faculties very largely. It may be considered a typical handicraft, and so a knowledge of the effects of moderate drinking upon it is of great practical interest.

"Such knowledge may be derived from Professor Gustav Aschaffenburg's experiments, published in 1896.¹ The four men, F. S., J. L., C. H., and K. O. G., chosen for the experiments, were typesetters of many years' experience, and so their experimental work could not be much influenced by accidental circumstances. Furthermore they had for years been moderate drinkers, and thus were not over-susceptible to the effects of alcohol. On the Sunday preceding the experiment days, they abstained from using alcohol entirely. The experiments extended over four days, from Monday to Thursday, inclusively, and consisted in setting type from printed copy (to avoid illegibility of manuscript) for five quarter-hours, commencing about 5 P.M. To avoid the influence of preconceived ideas, the results were not revealed to the men until the entire series of experiments had been completed. On Monday the

¹ See *Psychologische Arbeiten*, Vol. I, pp. 608-626 (Leipzig, 1896).

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men received no alcohol. On Tuesday 200 grams (about three quarters of a tumblerful) of strong Greek wine was administered at the end of the first quarter-hour of work. On Wednesday, again, no alcohol was taken. On Thursday they received another 200 grams of wine after the first quarter-hour of work. Assuming that during the first quarter-hour the men were 'getting under way' and were working more or less irregularly, we will consider only the results of the following hour. The results will be represented by the number of 'ems' set up.

"But before they can be properly understood, it is necessary to take into consideration a factor which is not generally known, namely, the gradual increase of one's output of work owing to daily practice. It is generally imagined that after a man has learned a trade and has worked at it for some time, he attains a certain maximum proficiency in it, and thereafter his work is neither improved in quality nor increased in quantity. That a musical virtuoso practises for many hours daily because he can thereby indefinitely improve his art, everybody understands. But that a bookkeeper, let us say, should do a larger amount of figuring on Tuesday because of Monday's addition to his experience, a still larger amount on Wednesday, etc., seems almost incredible. Yet it is a fact repeatedly demonstrated by various observers. Thus, to mention a single experiment: An experienced bookkeeper was given columns of one-place numbers and was asked to add as many of them as he could in a half-hour; he succeeded in adding 2323 figures. When the experiment was repeated the next day, he was found to have added 2994 figures. The number of such observations is myriad, and there are no exceptions.

"Returning to the work of our typesetters with this interesting experience-factor in view, we expect that normally, without any specific effect being introduced by

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alcohol, the typesetters should have accomplished more on Tuesday than on Monday, still more on Wednesday, and still more on Thursday. The following numbers of 'ems' set up by the four men represent the actual facts.

	Monday (no alcohol)	Tuesday (alcohol)	Wednesday (no alcohol)	Thursday (alcohol)
F. S.	2,339	2,212	2,560	2,353
J. L.	2,005	2,449	2,487	2,492
C. H.	2,241	2,265	2,458	2,314
K. O. G.	1,528	1,449	1,608	1,495

"The first thing that strikes the eye is that in five cases (underscored) the number of ems set up on Tuesday and Thursday is, not greater, but *less* than on Monday and Wednesday, respectively. Not only, then, has the alcohol taken on Tuesday and Thursday prevented the due increase, but it has produced a considerable *decrease*, in the men's efficiency. Further, although in the remaining three cases there is an increase, that increase is slight. Thus, J. L. set up only five ems more on Thursday than on Wednesday; practically no increase. On the other hand, the men did *very* much more on Wednesday (no-alcohol day) than on Tuesday (alcohol day).

"The conclusion is plain: the moderate quantities of alcohol impaired considerably our tradesmen's efficiency.

"But let us endeavor to ascertain, on the basis of what the typesetters did on Monday and Wednesday, just how much they would have accomplished, but for the alcohol, on Tuesday and Thursday. An approximate estimate can be made on the conservative assumption that, during short periods of time, the increase in effi-

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ciency from day to day is about the same. Now, from the fact that compositor F. S. set up 2339 ems on Monday and 2560 ems on Wednesday, figures representing an increase of 221 ems in two days, we may estimate that his experience-increase at that time amounted to 110 ems per day, and that under normal conditions he should have set up 2449 ems on Tuesday and 2670 ems on Thursday.

"F. S., then, should have set up 2449 ems on Tuesday. But he set up only 2212 ems. The difference, 237 ems, is about 9.7 per cent. of 2449. A moderate drink of wine made F. S. lose, for the time being, nearly 10 per cent. of his efficiency. The following table, obtained by similar calculation, gives the percentage losses on Tuesday and Thursday in the case of the four men:

PERCENTAGE LOSSES OF EFFICIENCY

	Tuesday	Thurs. day
F. S.	9.7%	11.9%
J. L.	0.0%	1.4%
C. H.	3.6%	9.9%
K. O. G.	7.6%	9.3%

"The four men are affected by alcohol to an unequal extent, as might be expected. But with the exception of J. L.'s case on Tuesday, there are losses of efficiency in all cases, and in most cases the losses are heavy.

"One more circumstance claims attention before the subject is abandoned. The losses are in all cases heavier on Thursday than on Tuesday. This can only mean one thing: The effects of alcohol are cumulative. In other words, the effect of Tuesday's drink is not entirely gone

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on Thursday, and Thursday's loss in efficiency is the effect of Thursday's drink *plus* a lingering part of Tuesday's effect.

"But if the effect of Tuesday's drink is not quite gone on Thursday, Wednesday's output would surely have been greater than it was if no drink had been taken on Tuesday; and as the above percentages of loss of efficiency are based on the assumption that Wednesday's product was normal, they are really too small. How much too small, it would be impossible to say.

"The experiments, although few in number, were carefully performed and point distinctly to the following conclusion: *Moderate drinking reduces considerably an artisan's efficiency. Its effect is cumulative, and the losses caused by it increase as time goes on. The widespread notion that moderate drinking helps an artisan in his daily work is false.*

"Of course there are alcoholic degenerates who are thoroughly incapacitated for work if alcohol is withheld from them. But organic degeneracy is not our subject at present; we are here considering the immediate effects of moderate drinking on the moderate drinker."

(10) ALCOHOL IN MEDICINE (p. 33)

I. WOULD remind the reader that throughout the text of this book I am citing the results of experiments and the opinions of authorities, my own attitude being simply that of an impartial recorder. It does not follow that I agree with the opinions of Dr. Davis because I quote him. Many of Dr. Davis's pupils, in common with the profession in general, believe that alcohol has a distinct place as a therapeutic agent. In certain fevers, for

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example, they believe that it has value in supplying oxidizable matter and thus sparing the tissues, conceivably tiding the organism over a brief crisis. Be that as it may, it is certain that alcohol is prescribed far less frequently than it formerly was, and that far smaller doses are given on an average. So Dr. Davis did pioneer work in the right direction, whether or not his extreme views require to be modified in the sequel.

(11) ALCOHOL AND LIFE-INSURANCE (p. 39)

THE statistics of the United Kingdom Temperance and General Provident Institution make an impressive exhibit when presented in detail. I reproduce the following table from *The Drink Problem*, edited by T. N. Kelyack, M.D., M.R.C.P.

Years	Temperance Section		General Section	
	Expected Claims	Actual Claims	Expected Claims	Actual Claims
	Policies	Policies	Policies	Policies
1866—70	549	411	1,008	944
1871—75	723	511	1,268	1,333
1876—80	933	651	1,485	1,480
1881—85	1,179	835	1,670	1,530
1886—90	1,472	1,015	1,846	1,750
1891—95	1,686	1,203	1,958	1,953
1896—1900	1,900	1,402	2,058	1,863
1901—05	2,021	1,456	2,221	1,961
Total, 40 yrs.	10,463	7,484	13,514	12,811

The statistics of the Sceptre Life Association, though dealing with smaller numbers, are almost equally instructive:

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Period	General Section			Temperance Section		
	Ex-pected Deaths	Actual Deaths	Per-cent-age	Ex-pected Deaths	Actual Deaths	Per-cent-age
1884—88	466	368	79.00	195	110	56.41
1889—93	564	466	82.62	312	184	58.97
1894—98	628	498	79.30	419	228	54.42
1899—1903	712	548	76.97	514	270	52.53
1904—05	287	233	81.18	232	115	49.57
Total 22 yrs	2,657	2,113	79.53	1,672	907	54.25

It should perhaps be explained that the "expected deaths" are calculated according to the Mortality Tables of the Institute of Actuaries. A glance at the above tables shows how large a percentage of teetotalers extend the term of their years beyond the "probabilities" calculated from the average experience of mankind. The persons insured in the General Section of the above table were obviously very "good risks" indeed; yet their death-rate is far higher than that of the policy-holders in the Temperance Section; and, as Dr. Eccles specifically states, "the factor of alcohol would seem to be the only one at work between them."

(12) THE AVERAGE CONSUMPTION OF ALCOHOL (p. 108)

THE computation summarized in the text is made on the following basis:

(1) Distilled spirits, amounting to 140,084,336 gallons, are assumed to have contained, on the average, 40 per cent. of alcohol (a conservative estimate, since good whisky contains 41 to 48 per cent., brandy 40 to 50 per

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cent., rum 40 to 80 per cent.)—an aggregate, therefore, of 5,603,373 gallons of pure alcohol.

(2) The wines, amounting to 57,738,848 gallons, are assumed to have contained an average of 9 per cent. of alcohol (French claret contains 6–12 per cent., French white wine 9–12 per cent., sherry 16–20 per cent., Madeira 15–16 per cent., champagne 8–11 per cent., sweet Catawba 10–15 per cent., American red wine 6–12 per cent.), accounting for 5,196,496 gallons of alcohol.

(3) The malt liquors, amounting to 1,814,695,785 gallons, are assumed to have contained an average of 4.63 per cent. of alcohol (that being the average strength of twenty-eight samples from various parts of the United States and Europe, as given by Friedenwald and Ruhräh), accounting for 74,022,421 gallons of alcohol.

The total quantity of absolute alcohol thus accounted for as having been consumed in the United States in 1907 is 84,822,290 gallons.

The population of the United States in 1907 is assumed to have been a round eighty millions, two-fifths of whom are assumed as of adult age.

The result deduced is then a simple matter of arithmetic.

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NAME	DATE DUE
<i>Dr. Crawford</i>	<i>ret. Nov 18, 1914.</i>
<i>E. Durgin</i>	<i>ret. Jan. 13, 1915.</i>
<i>C. Andrews</i>	<i>ret. Jan. 15, 1915.</i>
<i>C. Andrews</i>	<i>ret. Feb. 3, 1916.</i>
<i>acc</i>	<i>ret. Jan. 24, 1917.</i>
<i>Dr. Crawford</i>	<i>ret. Oct. 9, 1917.</i>
<i>F. H. Rahm</i>	<i>NOV 23 1931</i>
<i>C. H. Laro</i>	<i>NOV 24</i>
<i>Todd Bram</i>	<i>DEC</i>

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